The Brescia Hospital of the future

PHASE 1 - NEW MAIN HOSPITAL AND CHILDREN'S HOSPITAL

Project Design Document

Sistema Socio Sanitario
Regione Lombardia
ASST Spedali Civili
ARIA
AZIENDA REGIONALE PER L'INNOVAZIONE E GLI ACQUISTI

Sistema Socio Sanitario
Regione Lombardia
ASST Spedali Civili

LHA (ASST) SPEDALI CIVILI
General Director - Luigi Cajazzo
Health Director - Frida Fagandini
Technical Director - Marco Verga

Regione Lombardia

GENERAL MANAGEMENT FOR WELFARE
Director of the Special Healthcare Building Projects Organisational Unit
Maurizio Bracchi

ARIA
AZIENDA REGIONALE PER L'INNOVAZIONE E GLI ACQUISTI

REGIONAL AGENCY FOR INNOVATION AND PURCHASING
Giorgio Lampugnani
Maria Marta Zandonà

Single Project Manager (RUP)
Rodolfo Bandera

POLITECNICO MILANO 1863
DIPARTIMENTO DI ARCHITETTURA, INGEGNERIA DELLE COSTRUZIONI E AMBIENTE COSTRUITO
DESIGN HEALTH ABCLAB

POLITECNICO DI MILANO
Department of Architecture, Built Environment and Construction Engineering
Design & Health Lab
Stefano Capolongo (Scientific Coordinator)
Andrea Brambilla, Stefano Arruzzoli, Michele Dolcini, Isabella Nuvolari-Duodo, Erica Brusamolin, Beatrice Pattaro

Fondazione Politecnico di Milano

FONDAZIONE POLITECNICO DI MILANO
Territorial Engineering and Architecture Projects
Daniele Bignami

UNIVERSITÀ DEGLI STUDI DI BRESCIA

UNIVERSITY OF BRESCIA Consultant for urban planning aspects
Maurizio Tira

The purpose of this document is to provide indications and guidelines for participation in the international design competition for the *New Brescia Hospital*. The content of the document is intended for use only for the project design competition described, and must not be used for other purposes.
The design references and images contained in the document are intended as a thematic and informative cue for designers for the sole purpose of participating in the competition. The evaluations of the guiding committee will not favour a design or formal affinity to the above references.

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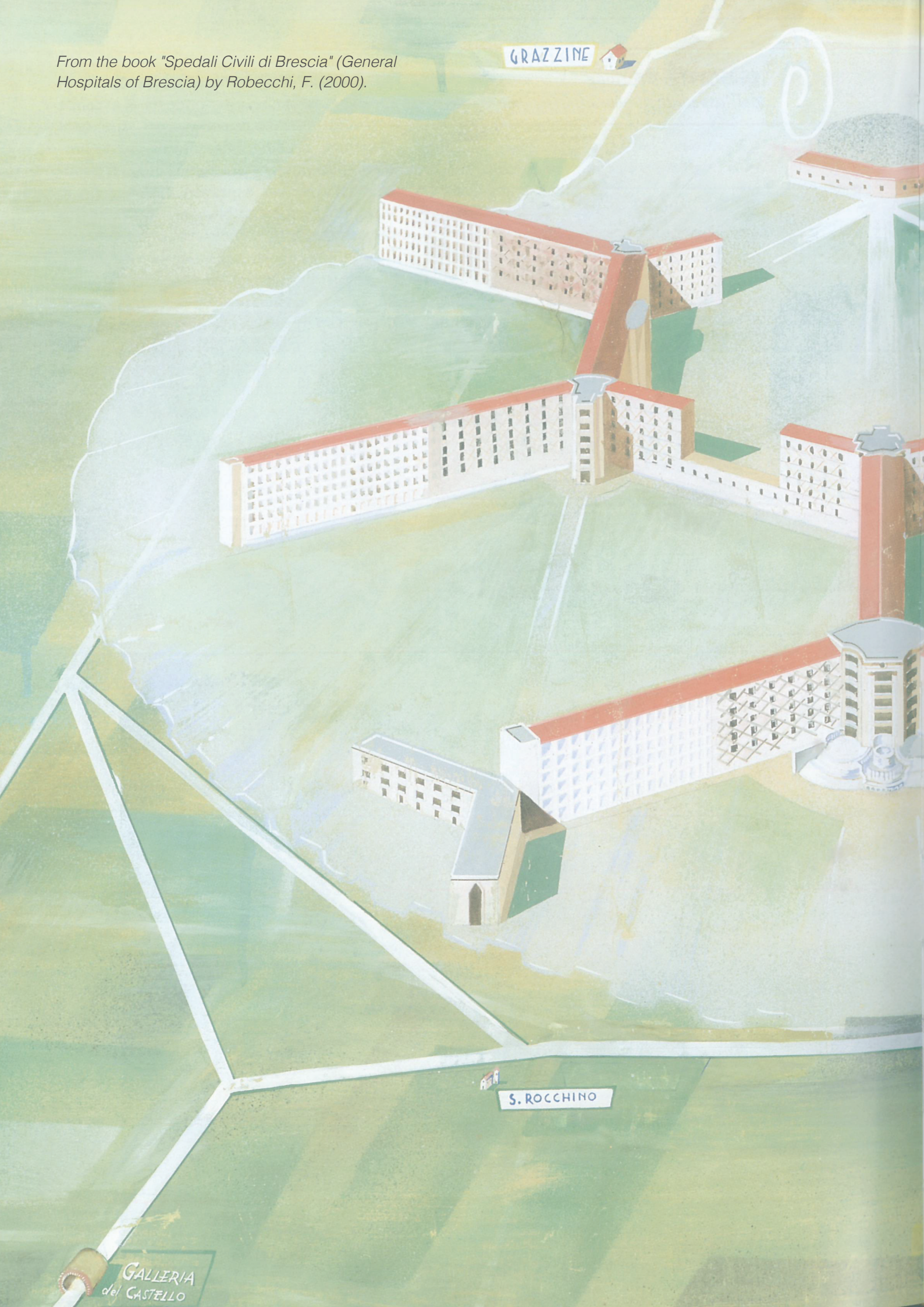
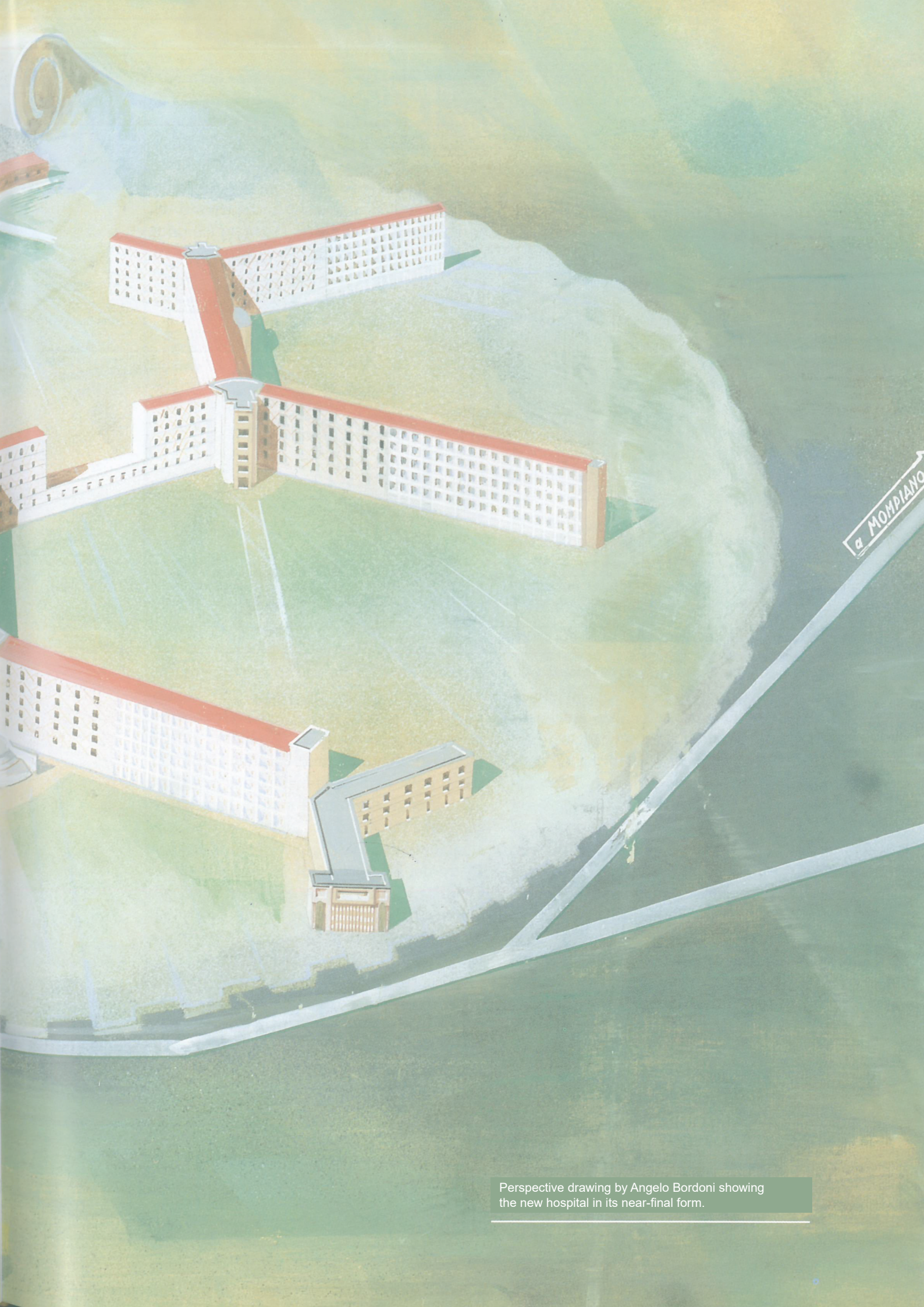
From the book "Spedali Civili di Brescia" (General Hospitals of Brescia) by Robecchi, F. (2000).





Perspective drawing by Angelo Bordoni showing the new hospital in its near-final form.

Introduction

Entrance to the Brescia Hospital

As part of plans for the LHA (ASST) Spedali Civili di Brescia, the intervention consists in redeveloping the hospital and in constructing the New Brescia Hospital of the future, i.e., the new Main Hospital and the Children's Hospital together with the overall reorganisation of the sector thanks to an integrated and future-oriented masterplan. Given the overall nature of the intervention, it is necessary to consider not only the functions of Phase 1, the subject of this Project Design Document (DIP), but also the connections that will have to follow with Phase 2 to implement the interventions and subsequently the Spedali Civili di Brescia Hospital Complex, a single harmonious system, with the possibility of inserting a functional link with the University. The intervention of the phase subject to the design competition will be developed in the northernmost area of the Spedali Civili hospital complex. It involves demolition of the hospital buildings called "Infectious Diseases" and "Satellite" for a total of about 85,000 sq.m, the creation of new surface areas dedicated to healthcare functions, particularly Emergency-Urgency, Surgical, Diagnostic, Maternal-Infant and Inpatient Areas, as well as common and technical-logistic support areas for a total of about 60,000 sq.m, as well as about 500 underground parking spaces. This Project Design Document (DIP) has been prepared in line with the requirements defined considering the implications identified with the solutions proposed in the Feasibility Document of Design Alternatives (DOCFAP), the urban and territorial constraints present, as well as the demands and objectives declared in the regional plan. The DIP also presents the main evolutionary trends of health-related architectures in the form of performance requirements supported by converging best practices and scientific literature into an Evidence & Practice-Based approach. In terms of size, specific type and category of the intervention to be carried out, this document indicates the characteristics, performance requirements and design drawings required to define the particular design levels and phases.

The design and reorganisation of the hospital faces the challenge of intercepting the main social, epidemiological and demographic demands by translating the major global trends into functional, spatial and technological features. The process pays particular attention to aspects of relationship with the urban context, the enhancement of existing cultural and architectural elements, the implementation of functional and spatial connections, interpreting the occasion as a laboratory for experimentation and innovation centred on a prototype of a Hospital of the Future.

The implementation of evaluation strategies and tools will allow to monitor over time the trend of various performance characteristics, such as flexibility, sustainability or social inclusion, ensuring high quality design, architectural and strategic solutions for the cutting edge infrastructure.

The information contained in the document is an intrinsic part of both the "design service specifications" and the tender documentation to award the public engineering service contract.

From the book "Spedali Civili di Brescia" (General Hospitals of Brescia) by Robecchi, F. (2000).

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INTRODUCTION

The chapter describes the evolution of the design process in defining the Project Design Document for the New Hospital, underpinned by guidance on the benefits of using guidelines and technical briefs for future-oriented hospital design.

Evolution of the design process

The project called “Brescia Hospital of the future” of the LHA (ASST) Spedali Civili di Brescia is an intrinsic part of the process of rethinking and innovating the Spedali Civili di Brescia complex. It stems from the growing need for structural and logistic renewal of territorial healthcare, responding to the new challenges of modern medicine. The intervention will take the form of gradual redevelopment of existing buildings by using a general intervention masterplan, and the construction of new hospital sectors within the existing perimeter walls of the historic site.

The hospital is part of a vast and articulated territorial context, with the catchment area of the territory under the remit of the LHA (ASST) Spedali Civili di Brescia, which counts 600,000 inhabitants. The Hospital in question is a centre for the management of high intensity flow, and territorial research centre, as it is a Level II DEA (Emergency and Admissions Department) and a University Campus.

The design of the Brescia Hospital of the Future is part of an overall renewal of the Hospital's healthcare building stock through different phases (PHASE 1 and PHASE 2). The first phase, which is the subject of this Project Design Document (DIP), relates to the construction of new buildings for the completion of the New Main Hospital, the Emergency-Urgency Area and the New Children’s Hospital, with their respective Birth Centre for an amount of €274,000,000. The second phase, instead, completes the work by redeveloping and enhancing the existing spaces, and by improving logistics with works amounting to €204,000,000.

This is the starting point for the design process of the new Hospital of the LHA (ASST) Spedali Civili in Brescia, called **Brescia Hospital of the Future**.

1. **Regional Council Resolution no. XI/5835** of 29 December 2021 approving the list of interventions for the new deed supplementing the Framework Programme Agreement (AdPQ) in the field of Healthcare, including the redevelopment **of the Spedali Civili di Brescia Hospital.** The project involves the **construction of new volumes** (Children's Hospital, north, east, west and central sectors), the **demolition of the Satellite General Hospital and of the Infectious Diseases Building**, and the **renovation of the hospital pharmacy.**
2. **Resolution no. XII/2478** of 3 June 2024, the Regional Council confirmed the priority of the intervention, allocating funds amounting to **€274 million** to the intervention. *“Investment programme art. 20 Law 67/1988 – Framework Programme Agreement for the healthcare investment sector referred to in Regional Council Decree no. XI/5835/2021. Supplementary programme agreement - Realignment of the investment programme indicated in Regional Council Decree no. XI/5835/2021 and Regional Council Decree no. XI/378/2023”*, confirming the priority nature of the “ *Spedali Civili di Brescia Hospital upgrading plan – first phase”* through the allocation, as part of the second excerpt of the supplementary programme agreement, of the total amount of €274,000,000.00, precisely €260,300,000.00 out of the funds indicated in art. 20 of Italian Law no. 67/1988, and €13,700,000.00 from available regional resources (chapter 13.05.203.14176 “Investments in healthcare”.
3. Approval on 24 June 2024 of **the Feasibility Study** by the General Director of the LHA (ASST) Spedali Civili di Brescia with Decree no. 669 of the redevelopment of the Brescia hospital complex, comprising demolition and subsequent reconstruction of a new hospital complex.
4. Signing of **the Memorandum of Understanding** on 9 December 2024 between the Lombardy Regional Administration, Municipality of Brescia, LHA (ASST) Spedali Civili, Province of Brescia, LHA (ATS) of Brescia and the University of Brescia for the construction of the Brescia Hospital of the Future, for the construction of the New Complex, and for redeveloping existing spaces.
5. Approval by decree of the **feasibility document of design alternatives (DOCFAP)** in April 2025.
6. Preparation of this **Project Design Document (DIP)**, preparatory to the Technical-Economic Feasibility Project (PFTE).

The **DIP** plays a crucial role in the design of a new hospital complex as it provides strategic, functional and technical guidelines. In compliance with the **Law on Public Contracts** (Legislative Decree no. 209/2024), the DIP plays a central role in the project planning and design process.

>Project Design Document (DIP) Annexes

Annexes to the DIP consist of:

Annex 1	General plan of the intervention area
Annex 2	Feasibility document of design alternatives (DOCFAP)
Annex 3	Cross-sections of Monoblock Building D
Annex 4	Parking plans
Annex 5	Photographic survey

TODAY YESTERDAY

2021

REGIONAL COUNCIL RESOLUTION no. XI/5835
Approval of the list of interventions for the new document supplementing the Framework Programme Agreement (AdPQ) on Healthcare.

2024

REGIONAL COUNCIL RESOLUTION no. XII/2478
The priority of the intervention has been confirmed, granting funding of €274 million.

Feasibility document of design alternatives (DOCFAP)
Redevelopment of the Brescia hospital complex, consisting of the demolition and subsequent reconstruction of a new hospital complex.

PROJECT DESIGN DOCUMENT (DIP)
Strategic document within which the characteristics, requirements and design drawings necessary for the definition of subsequent design levels are identified.

2025

MEMORANDUM OF UNDERSTANDING
Lombardy Region, Brescia Municipality, LHA (ASST) Spedali Civili and local authorities for the construction of the Brescia Hospital of the Future, for the construction of the New Hospital Complex and for the redevelopment of existing spaces.

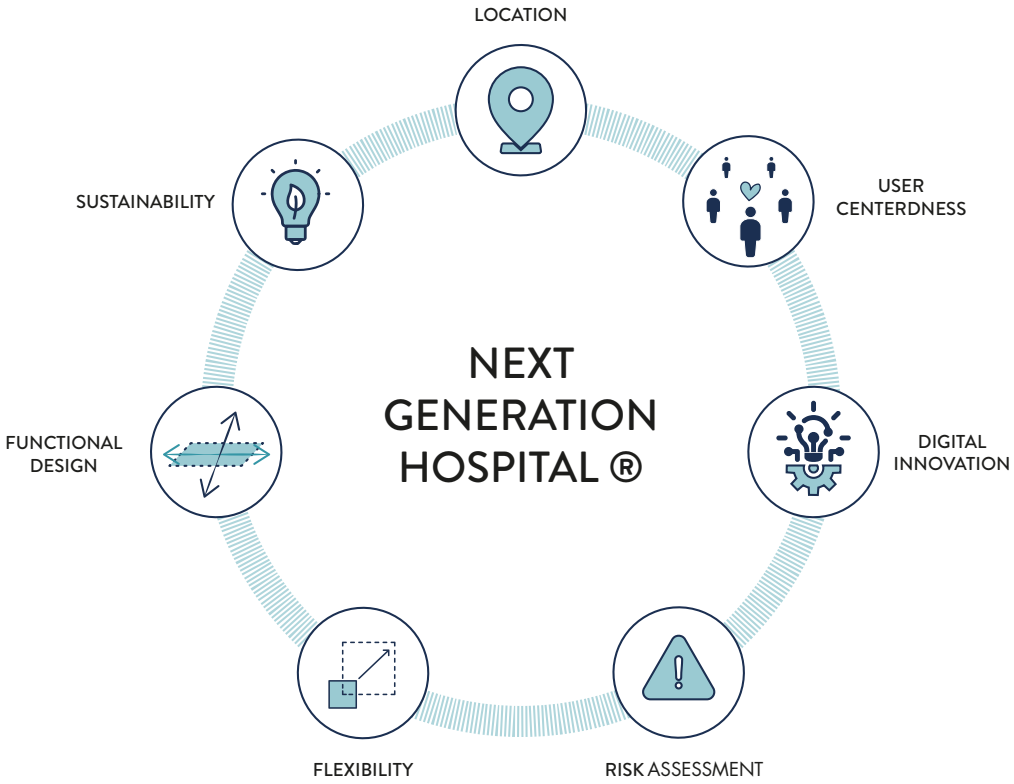
Design guidelines

The Project Design Document (DIP) was defined by using some of the most important international technical-scientific references for the design of new hospitals with the aim of aligning the project with best practices and global innovation benchmarks. The adoption of technical documents and guidelines allows to optimise the project, introducing advanced solutions both from a functional and managerial point of view, in response to the current and future needs of an evolving healthcare system.
The main institutional document used to guide strategies and design requirements is the Technical Brief: "Hospital of the Future", published by the World Health Organisation (WHO) in 2023, prepared with the support of the Design&Health Lab, Politecnico di Milano.
This document provides an innovative vision for the hospitals of the future, presenting the key functional and performance characteristics for a next generation hospital.
In addition to the WHO document, other important institutional references and sources of technical-scientific literature representing design models of excellence at national and international level were consulted in the European region.

Among these it is important to mention:

- **The "Meta-project Veronesi Plan"**, reported at the Finalised Research Project - Technical, Organisational and Management Guiding Principles for the Construction of High-Tech and Care Hospitals, and regulated by Ministerial Decree 12/12/2000. An innovative Italian model that integrates criteria of humanisation, functional features and sustainability into hospital design.
- **The different contributions defined by the NHS Health Building Notes, which provide guidelines for the planning and design of different hospital areas, with a strong focus on flow efficiency, safety and space optimisation.**
- **Design Guide for Health developed by the NSW Government of the Australian Regions**, which provides detailed guidance for hospital design with an approach based on technological innovation and operational efficiency.
- **The new model "Next Generation Hospital", with the Meta-design Requirements for the Hospital of the Future, the Functional Model, the Performance Model and the UNI Standard**, developed by the Joint Research Partnership Healthcare Infrastructure (JRP-HI) of Politecnico di Milano. A multi-actor research platform aimed at institutions and companies operating in the Healthcare & Life Science sector. The JRP HI platform develops and tests the evolutionary strategies of design, technological, organisational, construction and management innovation, which contribute to increasing the competitiveness, efficiency and effectiveness of existing models with respect to the transition of healthcare from an exclusively hospital-centred scenario to a sustainable user-centred perspective, within a physical and digital territorial network.

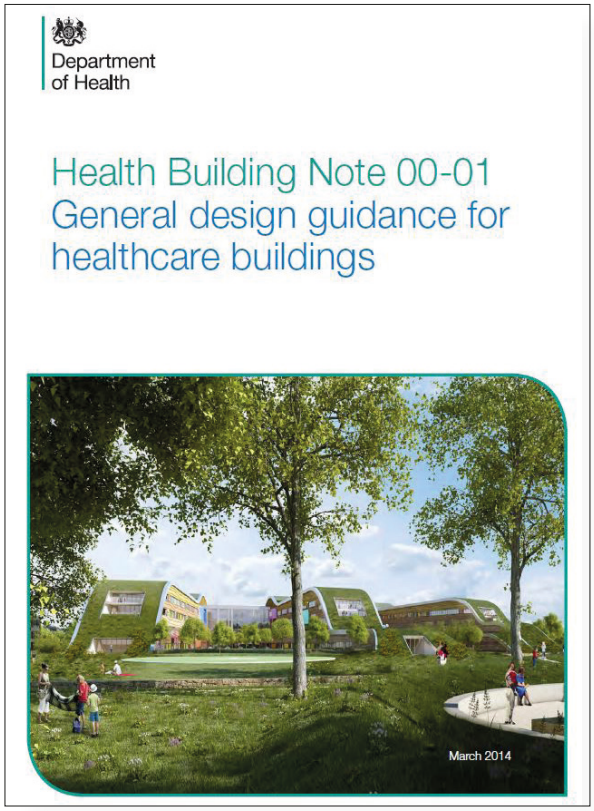
Together these references have allowed to build a solid methodological basis for the Project Design Document (DIP), ensuring that the design of the New Hospital complies with international standards, capable of responding to contemporary technological and organisational challenges, and promoting sustainable and inclusive healthcare centred on both patients and healthcare professionals.



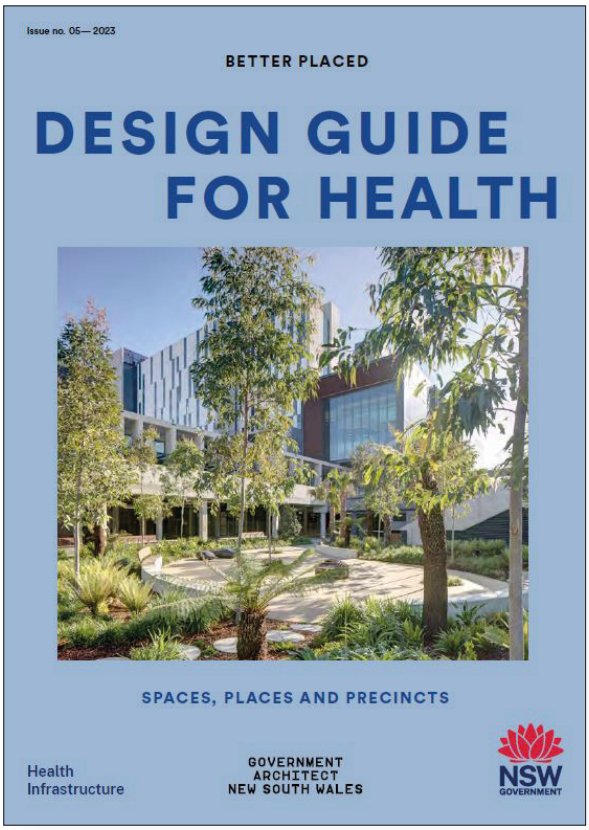
The Next Generation Hospital - Requirements for the Hospital of the Future

The Next Generation Hospital JRP HI Brief Annual report 2022, 2023, 2024

Meta project, Targeted Research Project



NHS Health Building Notes



Design Guide for Health, NSW Government of Australian Regions

Technical Brief Hospital of the Future

1

PHYSICAL AND PLANNING CONTEXT

This chapter summarises the urban planning framework of the intervention area, clarifying the drivers of medical planning together with the numerical endowment of the hospital. It identifies the evolutionary principles of health architectures by defining the state of the art for the new intervention.

Urban planning framework

Design Area

The Spedali Civili di Brescia Hospital and the Children's Hospital are located in Piazzale Spedali Civili no. 1, covering an overall territorial area of about 185,380 sq.m. The renovation project area occupies an area of about 50,380 sq.m, and is located on the North/Northeast perimeter of the Hospital, between Via Donatori del Sangue and Via Europa. The School of Medicine and Surgery of the University of Brescia, an institution affiliated with the LHA (ASST) Spedali Civili since its foundation (1982) and for years a place of fruitful and intensive collaboration stands in the immediate vicinity to the north. The Spedali Civili and the School of Medicine and Surgery are closely linked, both for the conspicuous presence of university professors working in the hospital by virtue of the aforementioned agreement, and for the attendance of thousands of students of study programmes in medicine, dentistry, pharmacy, biotechnology and the various healthcare professions, and hundreds of physicians attending specialist training.
These are two of the most important institutions in the Brescia area that share skills, know-how, experience and technologies as a service for the health and well-being of the person and, therefore, of the community, while also serving as a reference model for other geographical and economic contexts.

Chorography

From an orographic point of view, the area is flat and lapped by the course of the river Garza to the northwest (with pipelines starting from the intersection between Via Triumplina and Valsabbina).
The hospital is well positioned in an urban residential context featuring public services and use, with some remnants of industrial areas to the north undergoing redevelopment, and commercial areas to the west, on Via Triumplina, and to the south on Via Ducco and Via San Rocchino.
The residential fabric is characterised by medium-high density, with types mainly featuring the residential building within open blocks, separated by the road network.
The most important healthcare services include the following:

- the “Area Stauffer” outpatient centre of LHA (ASST) of Brescia;
- the Città di Brescia Clinical Institute to the southwest;
- the Rehabilitation Centre - Domus Salutis Nursing Home to the east;
- the Hospice Domus Salutis, also to the east.

School and research services include:

- the School of Medicine and Surgery of the University of Brescia to the north;
- the School of Engineering of the University of Brescia, further north;
- the Brescia campus of the Università Cattolica del Sacro Cuore to the northeast.

The main sports services include:

- the equipment of the University Sports Centre (CUS) of the University of Brescia to the north;
- the football stadium further north.

The Spedali Civili Hospital is easy to access, as it is well served by the local public transport system:

- the automatic medium-capacity rail system, with the “Ospedale” stop, located in the immediate vicinity of the main entrance (on Piazza Spedali Civili);
- the automatic medium-capacity rail system, with the “Europa” stop, located to the north, 600 m from the entrance to the Emergency Department and the Satellite General Hospital;
- suburban bus line no. 7 (Caino - Roncadelle), to the west, with the stop in Via Tosoni;
- suburban bus line no. 10 (Concesio – Poncarale), with stops in Via Schivardi;
- city bus line no. 15 (Mompiano – Noce), with stops in Via Schivardi;
- suburban bus line no. 17 (Ospedale – Castel Mella) with stops in Via Dal Monte and Via Schivardi.

The Spedali Civili Hospital of Brescia and the Children’s Hospital are also easily accessible by private vehicles along the following roads:

- from the South-West: from the “Brescia Ovest” (West Brescia) exit of the A4 motorway (or from exit 5 of the Tangenziale sud (Southern Ring Road), SPexSS11), taking Via Orzinuovi, Tangenziale Ovest (West Ring Road), Via Guglielmo Oberdan, Via Trento, Via Zadei and Via Dal monte, to the main entrance on Piazza Spedali Civili, 1; continuing on Viale Europa you will reach the northern entrance of the Satellite General Hospital and the Emergency Department;
- from the South-East: from the “Brescia Centro” (Brescia Centre) exit of the A4 motorway, and taking Via Borgosatollo and, through some alternative itineraries on urban roads, up to Via Turati and Via San Rocchino, up to the main entrance on Piazza Spedali Civili, 1; continuing on Viale Europa you reach the north entrance of the Satellite General Hospital and Emergency Department;

Satellite image with identification of intervention area

- from the North: from Via Triumplina (SP237), then along Via Trento, Via Zadei and Via Dal monte, to the main entrance on Piazza Spedali Civili, 1; continuing on Viale Europa you reach the northern entrance of the Satellite Building and the Emergency Department.

Concerning parking:

- the main car park is the underground car park "Ospedale Nord", with entrance on Via Donatori del Sangue, owned by Brescia Infrastrutture, in concession to Brescia Mobilità. It counts 1,200 parking spaces;
- the underground "Ospedale Sud" car park, with entrance on Via Ducco, owned by Brescia Infrastrutture, in concession to Brescia Mobilità, with 474 parking spaces;
- a small car park in Piazza Spedali Civili, with about 40 parking spaces at level and with payment;
- a small car park in Via Schivardi, with about 30 parking spaces at level and with payment;
- some level parking spaces on the Via Triumplina off-road at the Mortuary Halls.

The area is also well served by the city's cycle-pedestrian network and bike sharing service.
Hence, the Hospital area has good overall accessibility with intensive traffic, especially at peak times and on the route via San Rocchino – Viale Europa.
Moreover, the Satellite Building and the Emergency Department suffer from the single access route, Viale Europa - Via Donatori del Sangue, in the area most affected by the intervention in question.

Territorial planning

The Province of Brescia has a Provincial Territorial Coordination Plan (PTCP), approved by Provincial Council Resolution no. 31 of 13.06.2014;
The PTCP identifies the Hospital and the North University Campus as the main urban functional centres - Supra-municipal services (university and research, energy, health and sports).
These are areas which, due to the intensity and complexity of the settled functions, and in some cases due to opportunities for redevelopment

Overview of the area and analysis of the main roads

and development, acquire a strategic role in the organisation, recognisability and socio-economic appeal of the province.
In addition to the objectives for the settlement system for functional centres, the following specific objectives are adopted:

- for consolidated centres: strengthen their qualification and integration with complementary functions; ensure optimal accessibility conditions by public transport and connection to the main urban cycle lines; orient local neighbourhoods to accommodate functions of the centre that cannot be settled there, or complementary functions, favouring the recovery of abandoned areas and buildings or unused buildings.
- A clear indication in the direction of strengthening functional centres and maintaining proximity to context.

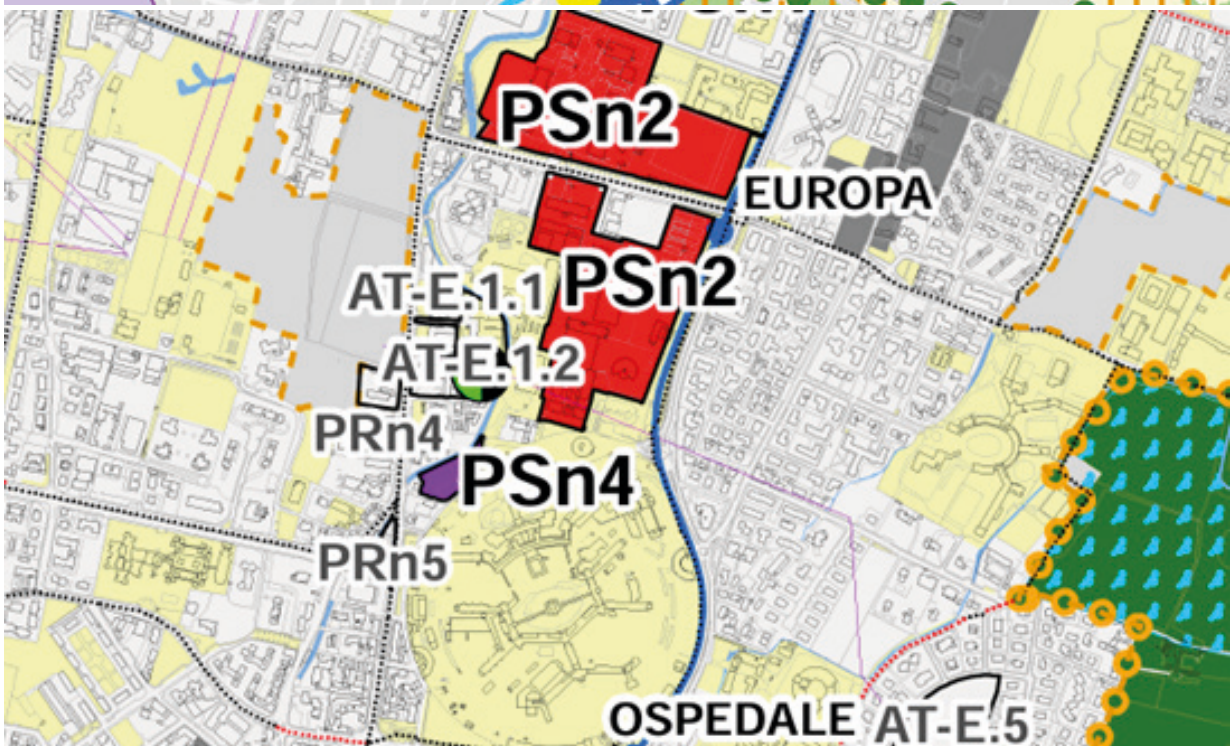
Hence, it is an area that, due to the intensity and complexity of the settled functions and the opportunities for redevelopment and development, acquires a strategic role in the organisation, recognisability and socio-economic appeal of the province.
Given this, the project "Brescia Hospital of the Future" must be able to fully meet the objectives required by the PTCP in these areas, which can be summarised as follows:

- select the functions to be installed, prioritising the innovative ones featuring high added value and low environmental impact;
- maintain an adequate supply of free areas or areas intended for light or green services to accommodate possible development in the medium and long term;
- ensure optimal accessibility by public transport and connection to the main urban cycle routes;

TABLE 1.2 of the PTCP: Structure and mobility. Territorial areas. The hospital is indicated in the "municipal and supra-municipal services"

TABLE V-DP01_ Chart of Vast Area Strategies. The area between the Hospital and the stadium (encompassing the university) is included in the perimeter of the "supra-municipal function centres"

TABLE V-PS01_ Service policies



- ensure good accessibility by private vehicles in addition to public transport, and ensure direct road connections with the main road network;
- identify mitigatory and compensatory measures for impacts on the urban system and neighbouring contexts;
- create connections with the green network and the municipal and supra-municipal ecological network, pursue high standards of environmental, urban and architectural quality.

The project area is also a preferred urban area for widespread ecological reconstruction (art. 51) where it is necessary to enhance the implementation of ecosystem services and improve territorial resilience to contribute to the reduction of critical environmental issues resulting from the pressure exerted by the urban settlement system.
Hence, for this area, the PTCP establishes the objective of containment of land consumption aimed at expanding urbanised fabrics by favouring urban regeneration.

The Territorial Government Plan (PGT)

The PGT is the main instrument introduced by Regional Law no. 12 of 2005 for municipal planning. It consists of the Plan Document, the Services Plan and the Rules Plan.
The Municipality of Brescia has a PGT approved by the City Council with Resolution no. 57/19378 P.G. of 19.3.2012, in force from 24.10.2012 (B.U.R.L. no. 43 - series of notices and competitions).
With Resolution no. 60 of 16.10.2023 the City Council approved the fourth variant of the PGT together with the counterclaims to the observations submitted. The deeds of variation became effective with the publication of the notice of their final approval in the Official Bulletin of the Lombardy Regional Government on 21 February 2024, series of notices and competitions no. 8.
The municipal administration has recently activated the procedure for a fifth variant to the current PGT. The timing of this variant is not compatible with the Project Design Document (DIP) editorial staff, but it may be compatible in the application phase for building permits.
This document contains extracts from the tables and rules concerning the framework of the Spedali Civili di Brescia Hospital and the Children's Hospital.

The same forecast is taken up by the PGT. The analysis of the settlement system present in "TABLE V-DP01_Chart of Vast Area Strategies" of the Plan Document (of the PGT approved in 2016) reveals that Spedali Civili di Brescia Hospital and the Children's Hospital are identified as the supra-municipal functional centre "Europe" (see also art. 86 of the PTCP).
The function of being a supra-municipal centre ranges from the Hospital in the south, to the stadium in the north, incorporating the university, a further strategic justification for the redevelopment of the Hospital on its site, and for the functional and strategic connection to the north with the university's educational and research services.
The strategic nature of the Hospital is also reflected in Table V-PS01 of the Service Plan.
From the point of view of the hospital network, the Spedali Civili di Brescia Hospital and the Children's Hospital are classified with code O1a "Hospital service: hospitals", according to art. 55 of the Technical implementation rules (NTAs) of the Service Plan, as reported in "TABLE V-PS02_ Discipline of service areas". The Laundry area is classified O1 "Hospital Services".
"TABLE V-PS04_ Urban public transport system" of the Service Plan reports that the area in question has a good level of urban public transport service, affected by a project to redevelop Viale Europa, which has already been partially completed.

Urban planning indices and parameters
Regulatory references are given below:
- articles 55, 57 and 58 of the NTAs of the Service Plan
- Table V-PR02 of the Rules Plan

The urban planning indices and parameters of zone O1a, reported in "TABLE V-PR02_ Plan Actions" of the Rules Plan, are:
- Land Use Index (IUF): 1.0 sq.m/m.
- Coverage Ratio (Rc): 50% Land Surface Area (Sf);
- SPer: 35% Sf.

The urban planning indices and parameters of zone O6b where the Laundry building is located, reported in "TABLE V-PR02_ Plan Actions" of the Rules Plan, are:
- IUF: 0.60 sq.m/m;
- Coverage Ratio (Rc): 50% Land Surface Area (Sf);
- SPer: 35% Sf.

TABLE V-PS02_
Discipline of service areas

Health services

TABLE V-PS04_
Urban public transport system

Public transport system

Metrobus line

Transport line

Levels of public transport service

Good

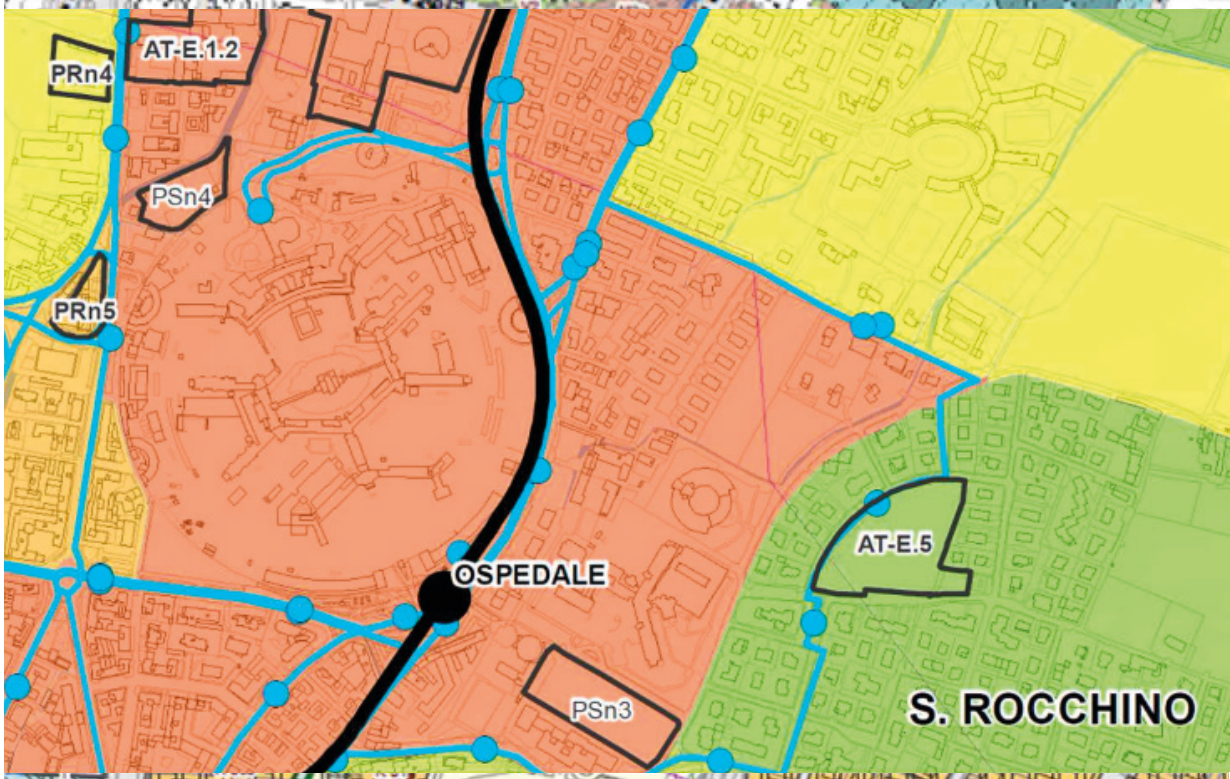
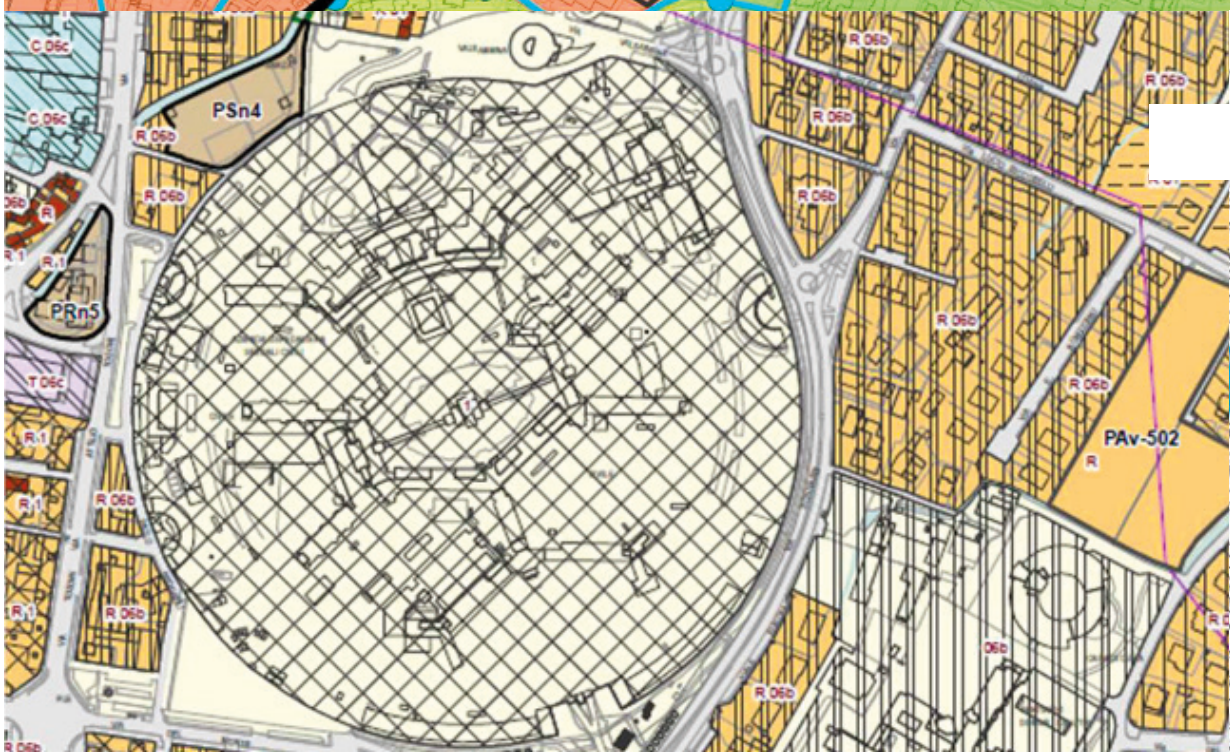


TABLE V-PR02_
Plan Actions

IUF: 1,0 mq/mq

Rc: 50% di Sf SPer: 35% di Sf



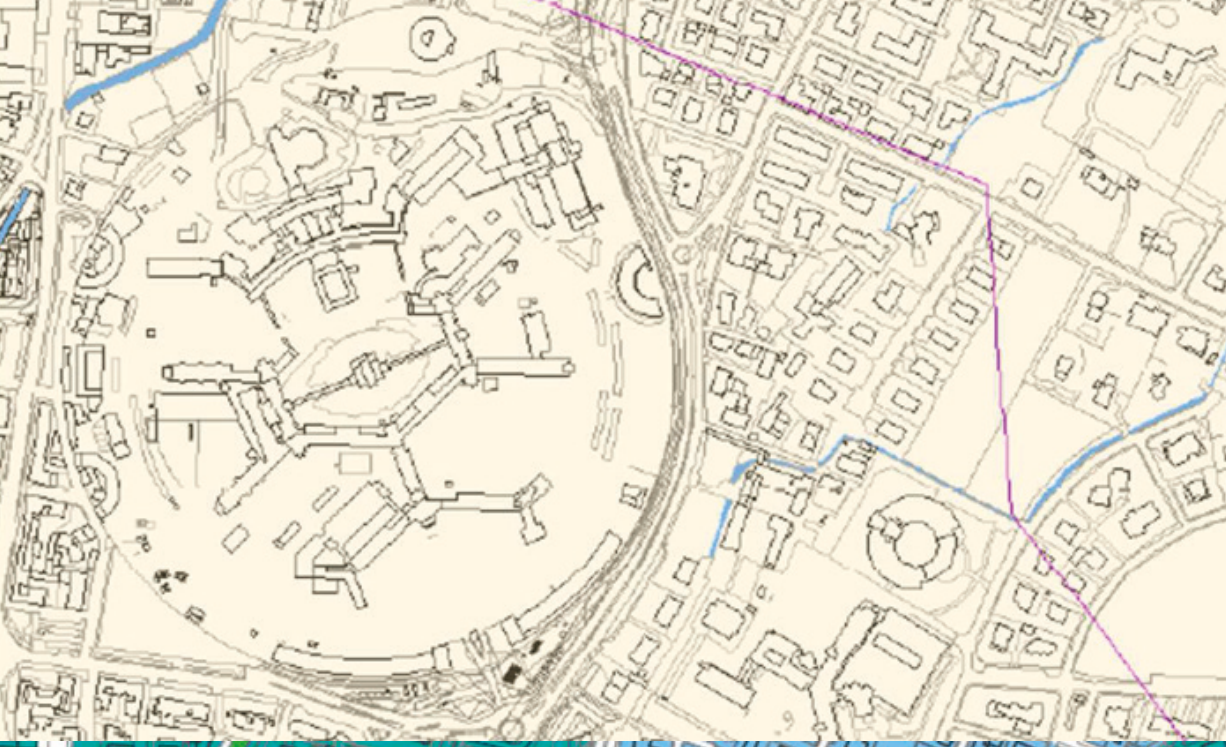


TABLE V-PR06_Table of archaeological constraints

Area of archaeological interest

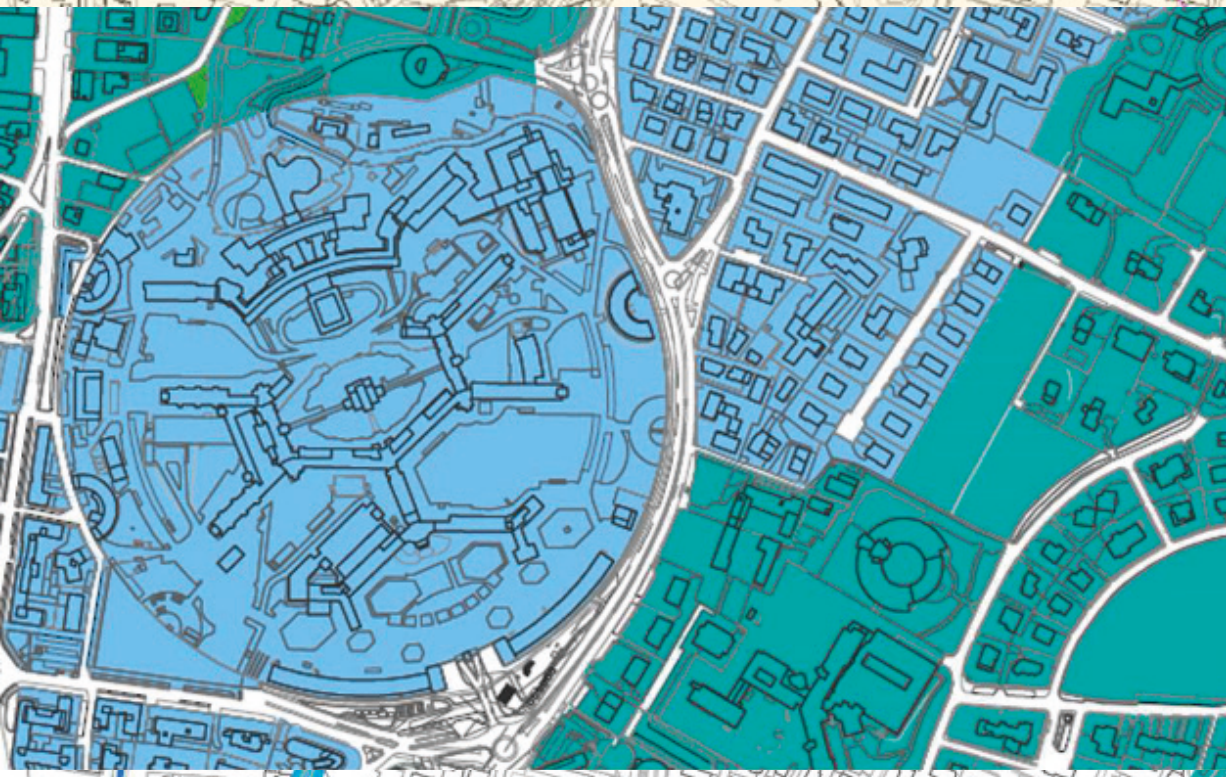


TABLE PR03_ Landscape sensitivity classes

The landscape of the Brescia area

Landscape sensitivity class - Medium

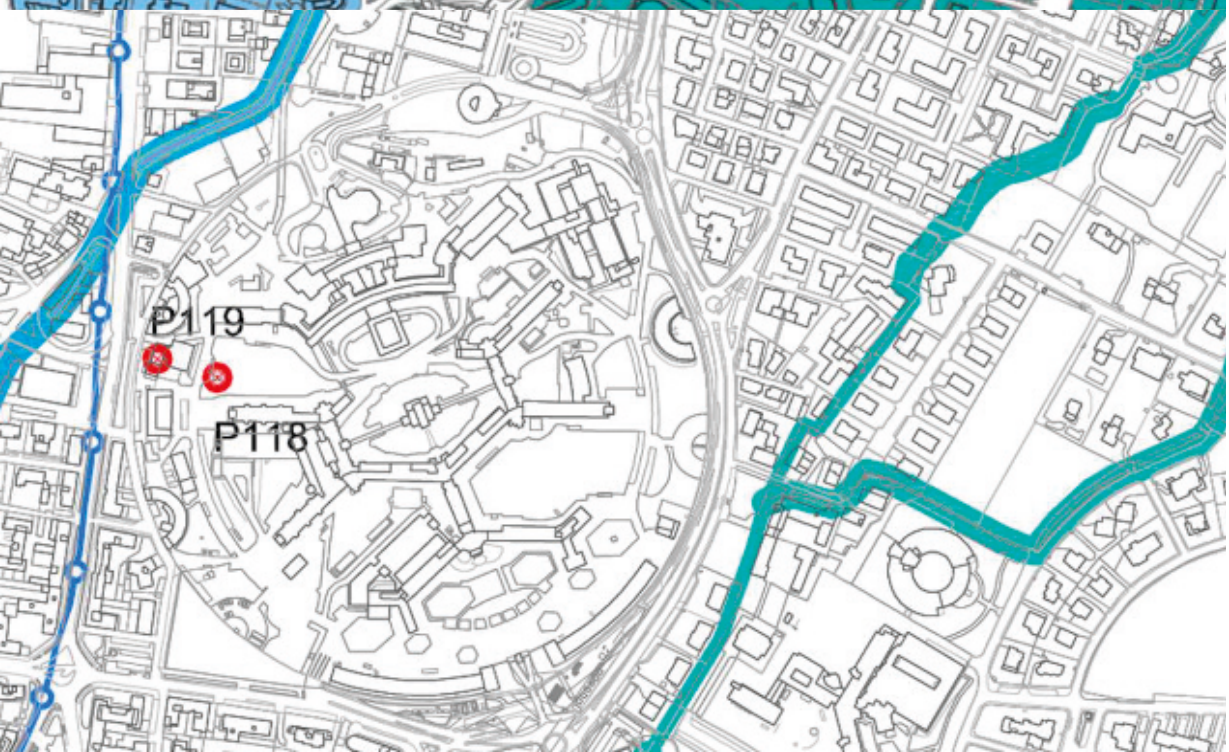


TABLE PR06_ Constraints for soil protection

Wells (Legislative Decree 152/99)

Px Active wells

Absolute protection areas (10 m)

The implementation of the project "Brescia Hospital of the Future" is compatible with the urban planning destination of the area.
However, the project will have to be released from the existing index of land buildability, as currently the Spedali Civili Hospital and the Children's Hospital are already in derogation from the indices envisaged by the urban planning instruments in force.
The increase in gross floor area required may be subject, alternatively:

- to specific urban planning variant as part of the Fifth General Variant activated by the Municipal Administration;
- to a Programme Agreement between the LHA (ASST) of Brescia, the Municipality of Brescia and the Lombardy Region, also submitted for approval by the City Council.

Additional rules
"TABLE V-PR06_Table of archaeological constraints" of the Rules Plan indicates that the area where the Spedali Civili di Brescia Hospital and the Children's Hospital is identified as an area of archaeological interest.
This extensive area provides for a specific procedure in the planning and implementation phase of works, with the obligation of supervision by the Archaeological Superintendency.
As reported in "TABLE PR03_Landscape Sensitivity Classes" of the Rules Plan, the area belongs to landscape sensitivity class 3 - Medium.
Moreover, there are two active wells near the water plant, and for a radius of 10 m the area is under absolute protection (Legislative Decree no. 152/99), as defined in "TABLE PR06_Table of constraints for soil protection" of the Rules Plan.
If necessary, please consult tables V_PR05 "Geological feasibility table" and PR11 "Landscape constraints" on the Brescia Municipality website.
A study of the documentation constituting the Territorial Government Plan (PGT) of the Municipality of Brescia and the Provincial Territorial Coordination Plan (PTCP) reveals no acts of territorial and sectoral planning relevant for the Spedali Civili Hospital and the Children's Hospital.

Conclusions

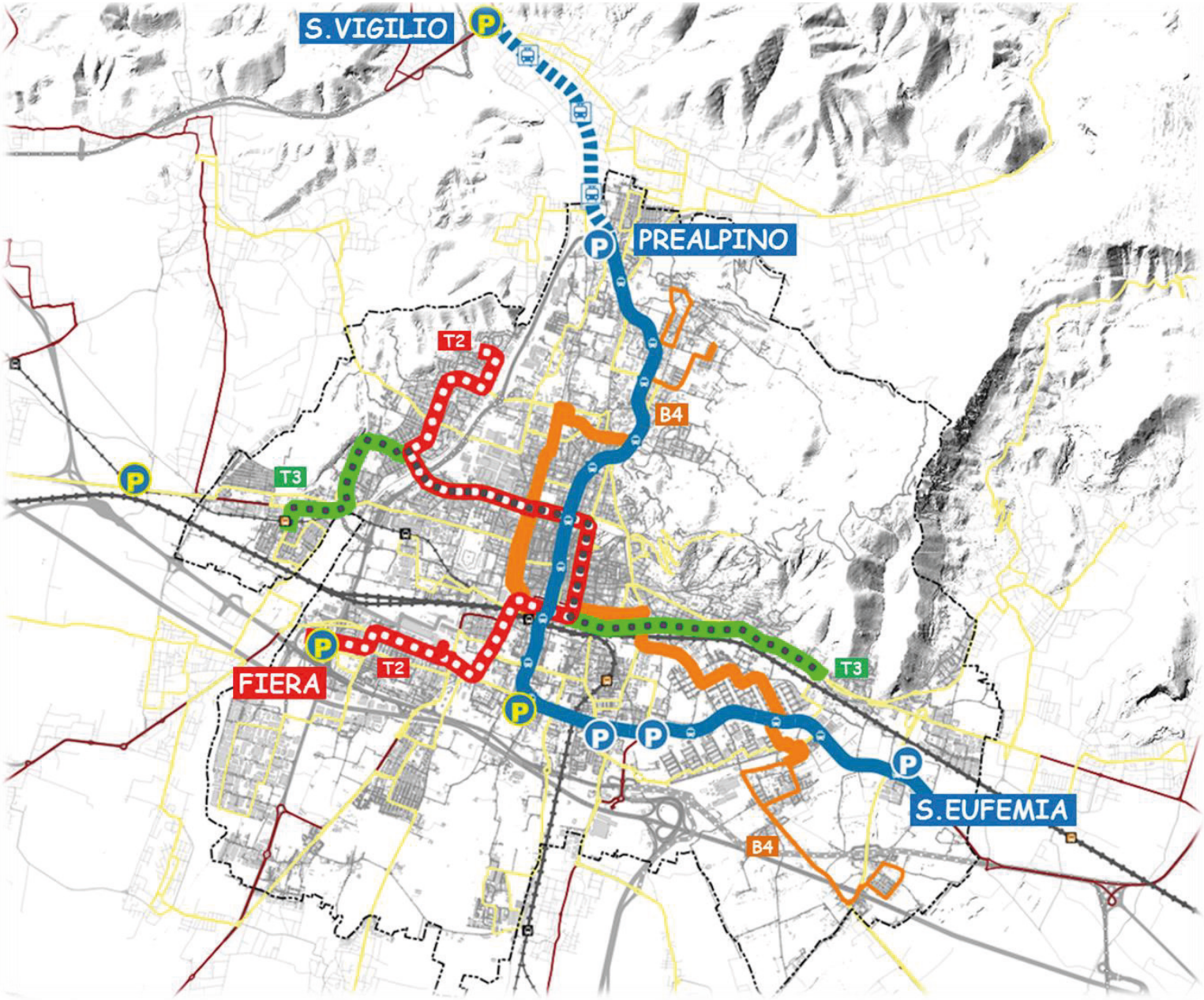
In conclusion, the analysis shows that the current site of the Spedali Civili Hospital and the Children's Hospital:

- is central considering the distribution of users in the territory;
- has good road accessibility;
- is inserted in a supra-municipal level centre, which extends northwards from the Hospital to the Stadium;
- is highly accessible by local public transport services, with 4 bus lines and an automatic medium-capacity rail line.

It is also worth mentioning the scenario of enhancing accessibility designed by the Urban Plan for Sustainable Mobility (PUMS), approved by Municipal Council Resolution no. 7 of 19 February 2018.
It provides that the main option of upgrading the public transport system in the urban area is to be pursued by identifying three lines of force, corresponding to as many high-level service buses, obtained with traffic lights and protection of the site, with transit frequencies fixed at 7'30".
The first line of force, consisting of the subway (line M1), is therefore joined by the following three lines:

- B2 Oltremella – Centro (Centre) - Stazione FS (Railway station) - Fiera (Trade Fair) (Brescia West exit)
- B3 Vallecamonica – Centro (Centre) – S.Eufemia
- B4 Hospital – Veneto – Stazione FS (Railway station) – Foro Boario – S.Polo.

The first two routes take up the existing design of lines 2 and 3 of the current city bus network, with the important variant of transit on Via Corsica, rather than Via Cremona, to cross the railway line.
The newly designed B4 line, instead, serves both important areas discovered by the subway (in particular the main institutions of upper secondary education in the city), and strengthens the role of the West/South Ring, an alternative to the transit crossing the centre of line B2. The bus system, instead, lends itself to the management of line extensions serving the municipalities of the belt.



Scenario P of the PUMS: see, in particular, bus route B4 in orange

State of the art

Historical development of the Hospital

The intervention area has characteristics of particular historical and architectural value, as the history of the Spedali Civili dates back to the fifteenth century, and is closely interwoven with that of the city of Brescia. The Spedali Civili derive from the “Hospitale unum magnum et universale” (hospital for the whole world) established in 1447 to bring together in a single facility the many institutions that were in charge of caring for the sick and needy. The name “Spedali Civili” of Brescia was established in the late 19th century when the hospital was located in the city centre. In the early 20th century, the insufficiency of the premises with respect to the needs expressed by citizens required the construction of a new functional and modern hospital, according to the design of Eng. Angelo Bordoni, from Brescia, an expert in urban planning and healthcare constructions. It was an innovative project, as - for the first time - the characteristics of the old hospital divided into various buildings were reconciled with the most recent monoblock structures. The design of the first buildings is dated 27 February 1934, but many preliminary drawings had already circulated since the autumn of 1933. In 1936, the aggregation of the Children's Hospital and the desire to turn the new hospital towards the city and the Cidneo Castle led to an important planimetric change, namely the shift of the entrance to the south-east, where it was actually built. The executive design by Eng. Bordoni was approved in 1939. The central hexagon lost its dominant image with the extension of the radial arms that are no longer appendices, but more extensive buildings, and with the loss of the northern sides. The main body of the Spedali Civili di Brescia Hospital is defined by a structure, which takes on a hexagonal shape and from whose vertices emerge radial branches ending with a Y fork. The hexagonal profile is repeated within the ring with porticoed corridors that connect radially to the outline and concentrate, through covered walkways, on a central building, the Church. Outside the structure there are three other buildings used as the residence for nuns, a mortuary with the forensic pathology department, and an entrance to the west. The three buildings are still marked with the letters A, B and C.
The ceremony with the laying of the foundation stone took place on 28 October 1938, on the anniversary of the March on Rome.

In June 1945 the building structures were almost complete and unchanged for years, but the new hospital was only inaugurated on 10 December 1950, due to the significant slowdowns suffered during World War 2, while the first patients were moved in March 1951 to Building A. In 1953 the old hospital was permanently decommissioned and all the wards were placed in the new location. At the top of the two missing sides of the central hexagon is the small building used as a morgue, which visually completes the geometric figure. In 1953 the church was completed. In the 1960s, the Bordoni layout was abandoned due to the increased need for beds, and the project was completed, involving the construction of the fourth building in the completion area of the Bordoni ring, no longer closing the central square in the original planned hexagon, but moving the new block northwards. The morgue was rebuilt in a semicircular building along the perimeter of the hospital area, and the new Satellite General Hospital was completed in 1967. It has ten above-ground floors in the central block, while the wings have eight above-ground floors. It was not until 1972 that the first patients were transferred to the new facility. The Infectious Diseases Building (Building 7) located to the northeast, towards Building C, was completed In 1977, slightly distorting the original Bordoni boundary. The building features a total break with the original layout of the hospital, also refusing any dialogue with the architecture and language desired by Bordoni. In 1998 the children’s hospital was integrated into the General Hospital, with volumes placed next to Building A, in stark contrast with the stylistic traits of the existing building. In 2001, a sector for the new operating blocks was also placed next to the central part of building B. Here the contrast between old and new is mediated by a coating with materials that recall the historical building next to it. The first Project Financing in the healthcare sector between 2002 and 2005 (amounting to €38,000,000) doubled the body of the two arms that continue from stairwell 2 to stairwell 3 and stairwell 5, including the rise of an additional floor compared to the existing six. In this case, materials were used in full harmony with the existing ones. Monoblock D, the renovation and creation of new units for Building C, the extension of the central body of Building A and the construction of the kitchen-canteen building were carried out thanks to the second Project Financing, implemented between 2010 and 2017. The structure that will house the new polyclinic, located on the eastern perimeter of the Bordoni walls, is currently under construction.

The original structure of the Spedali Civili di Brescia (1946) in the urban context of Mompiano. Note the perfect circle of the so-called "Bordoni" walls before the recent changes in the north-east sector (source: Gruppo 2009, Magazine of art, culture and current affairs).

> Historical development of the Hospital

BORDONI PROJECT

from 1934 to 1967

27 February 1934

First buildings of the Brescia hospital complex

1936

Aggregation of the Children's Hospital

Decision to turn the new hospital towards the city and the Cidneo Castle

The entrance is shifted to the southeast

1939

Approval of the executive project by Eng. Bordoni

The central hexagon-shaped building becomes dominant

The radial arms become larger building units

Loss of northern sides

1938

Installation of the foundation stone

1945

Building structures are almost complete and unchanged for years

1950

Opening of the new hospital

1951

The first patients are transferred to Building A on the façade

1953

The church is completed

SPEDALI CIVILI HOSPITALS

from the 1960s up to present day

1961

Construction of the fourth building in the completion area of the Bordoni ring is completed

1967

Construction of the morgue in a building along the perimeter of the hospital area and the new Satellite General Hospital

1977

Completion of the Infectious Diseases Building (Building 7)

1998

The children's hospital is integrated into the General Hospital

2001

A sector for the new operating blocks is placed next to building B, mediating the contrast between old and new

2002 - 2005

The two-arm body is increased two-fold with continuity of existing materials

2010 - 2017

Construction of monoblock D, the units added to building C, and the extension of the central body of building A

Today

Construction of the new polyclinic

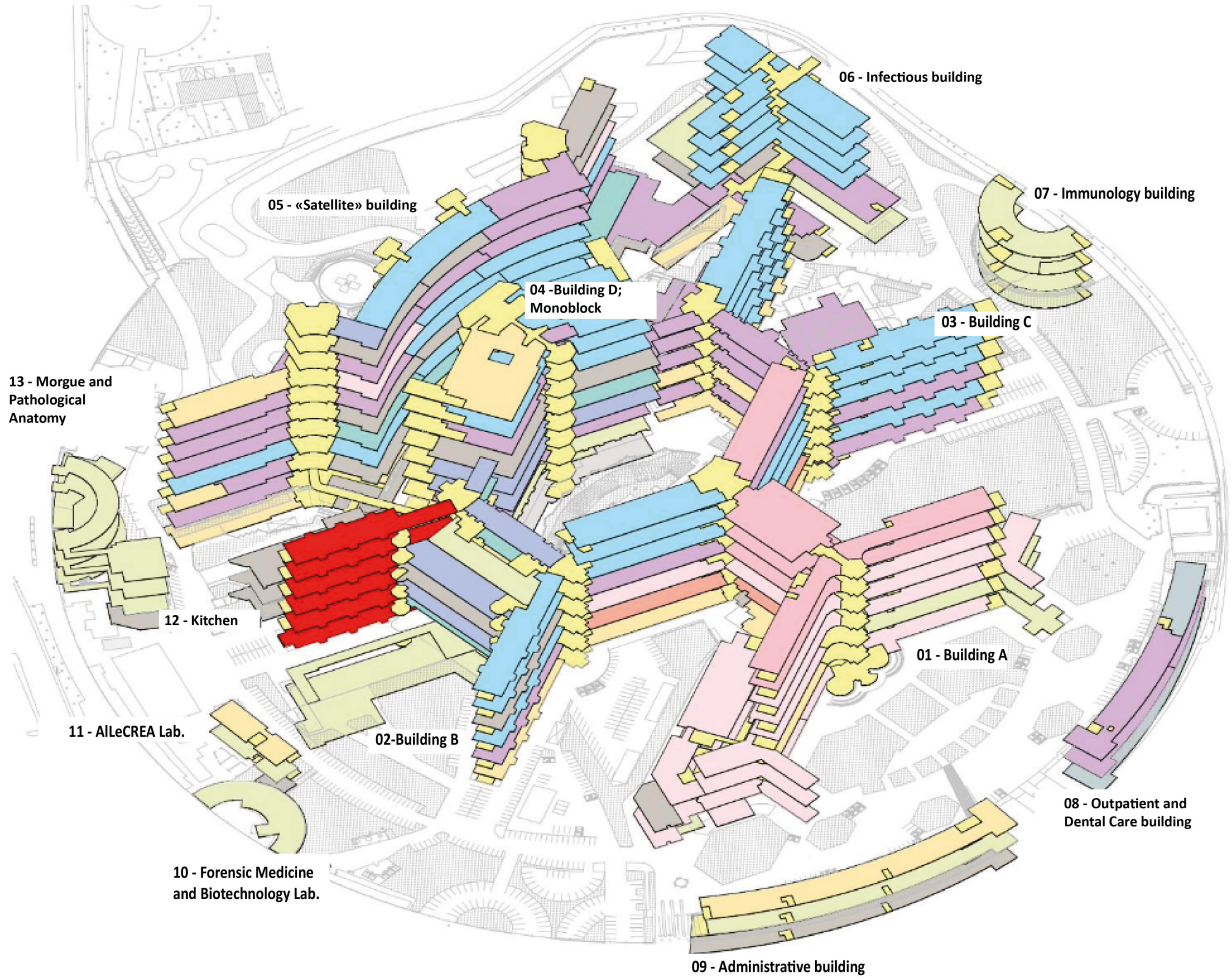
Current state of the clinical and management framework of the Hospital

The following diagram and table shows the distribution of functional areas of the entire Hospital and their relative size.

CURRENT STATE						
CODE	FUNCTIONAL MACRO-AREA	ORD. BEDS	DH/DS BEDS	LIS TRs*	COM TRs**	SURFACE AREA (M^2)
AF01	MATERNAL-NEONATAL AREA	110	-	-	4	7.880
AF01'	PAEDIATRIC AREA	149	18	3	24	15.630
AF02	DAYCARE AREA	55	24	11	83	33.075
AF03	INTERVENTIONAL AREA	-	-	-	-	10.990
AF04	INPATIENT AREA	874	4	1	3	38.165
AF05	INPATIENT INTENSIVE CARE AREA	51	-	-	-	6.750
AF06	URGENCY AREA	10	-	-	-	2.870
AF07	HEALTH SERVICES AREA	-	-	-	-	26.665
AF08	STAFF AREA	-	-	-	-	17.175
AF09	USERS AREA	-	-	-	-	3.545
AF10	GENERAL SERVICES AREA	64	2	-	-	30.995
AF11	EDUCATION DIVISION	-	-	-	-	1.905
AF12	COVID AREA	162	-	-	-	5.265
AF00	GENERAL CONNECTIVE AREA	-	-	-	-	43.300
	TOTAL	1.475	48	15	114	244.210

** Low Intensity Surgery Technical Rooms"*
***Complex Outpatient Macro-Activities Technical Rooms"*

Summary table of functional areas of the state of the art.



Three-dimensional diagram of the functional areas of the Hospital.

Medical Planning

Contextual and socio-economic framework of the intervention

The demand for care and the supply of healthcare are influenced by the state of health of the target population, which in turn is strongly linked to the continuous and inevitable sociodemographic and epidemiological transformations. Hence, the planning of health and socio-health interventions, but also social and welfare interventions, of a territory cannot disregard the analysis of population dynamics and the major pathologies that affect it, and which cause mortality and/or chronicity. It is with this in mind that context analyses are developed, the results of which make it possible to identify the determining principles of healthcare for the territory of the province of Brescia, and to examine their evolutionary forecasts in relation to the provincial, regional and national situation.

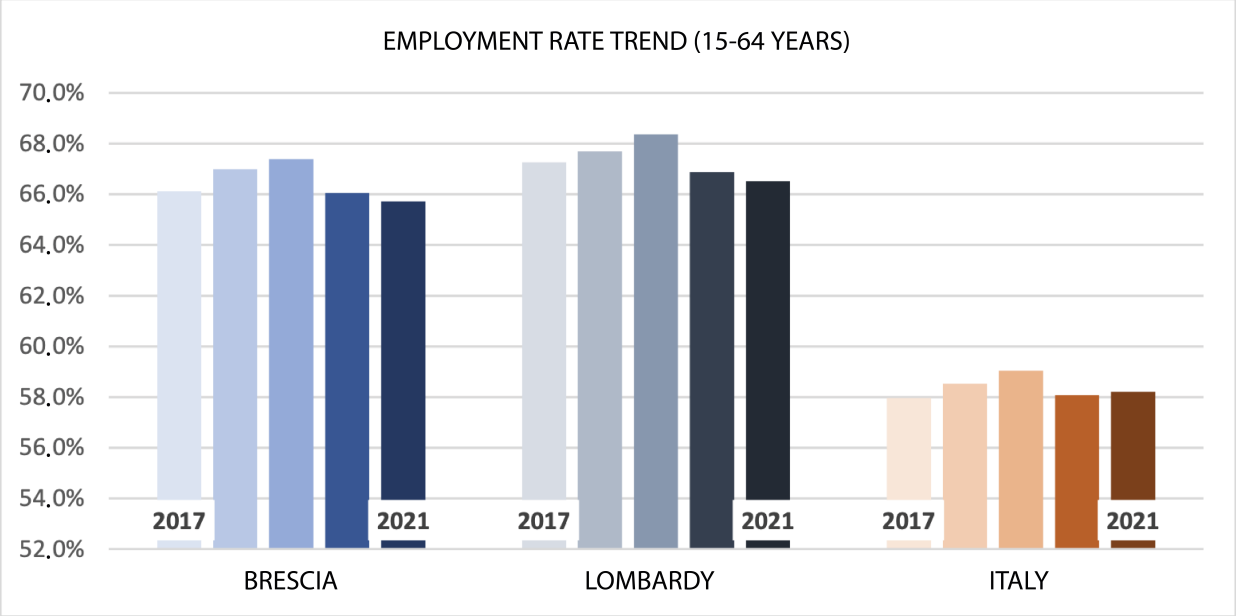
The socio-economic characteristics of the population include important social structure variables that can impact on the state of health of citizens by conditioning their demand for care. Indeed, it is generally people of low social status who have worse health conditions, both in terms of perceived health and chronic morbidity and/or disability. The Lombardy population is analysed below, taking into account a series of indicators relating to employment and economic well-being.

The employment rate of inhabitants aged over 15 and under 64 residing in Lombardy progressively increased between 2017 and 2019, with a decrease in 2020 and 2021, remaining above the national average.

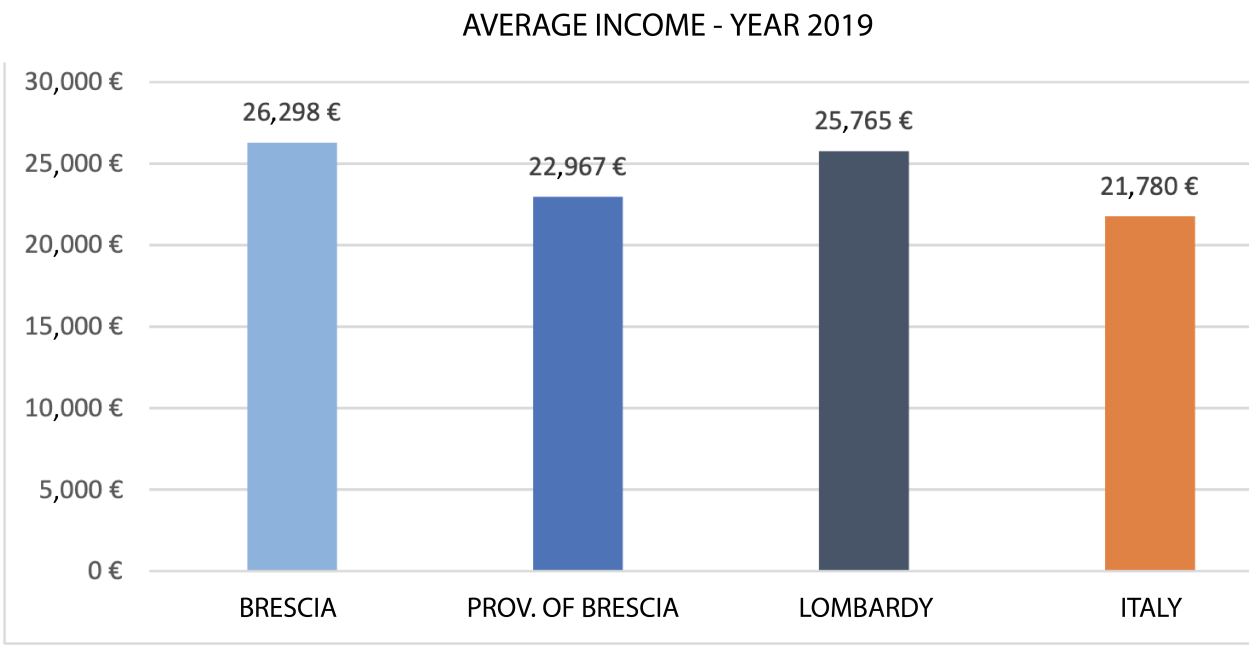
The province of Brescia presents a similar trend to the regional and national one with a less marked decrease (-1.9%) between 2019 and 2020. For the last available year (2021), the value of the estimated rate for the territory of Brescia (62.5%) is lower than the regional value (by 0.8 percentage points) but higher than the national average figure of 7.5 percentage points.

The indicators taken into account for the analysis of economic well-being show that the average income and taxpayers' income of the province of Brescia is lower than the regional average but higher than the national average.

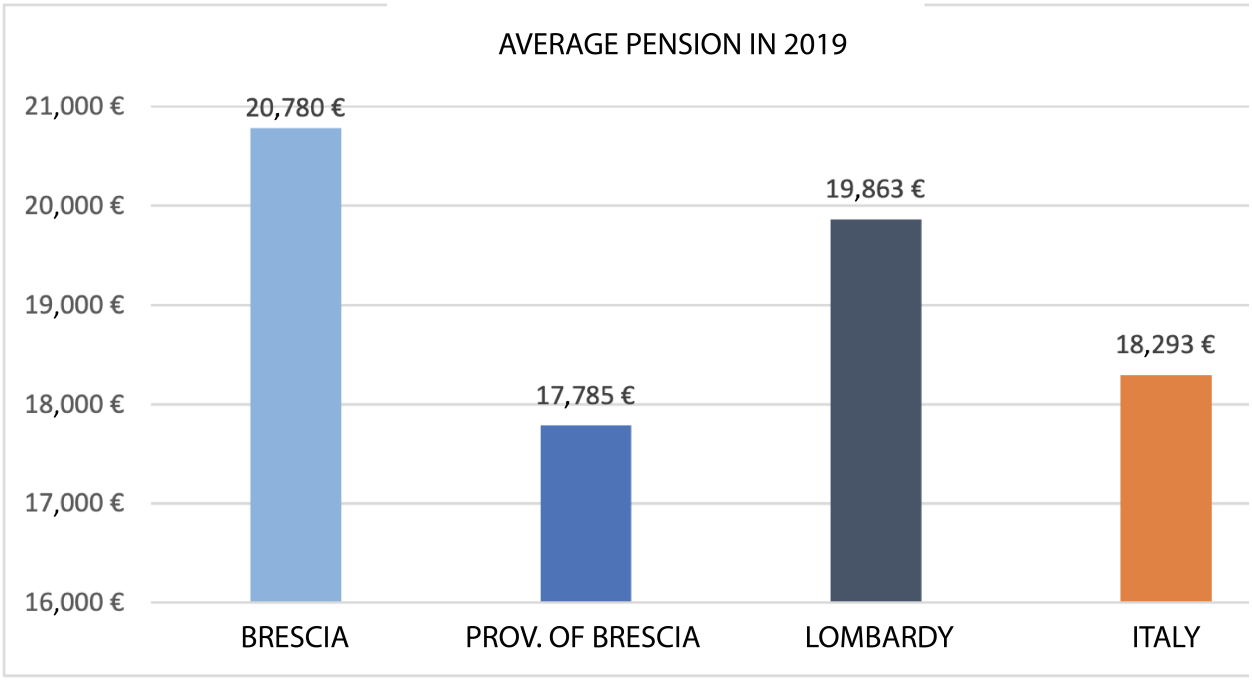
The value of the average pension of the inhabitants in the province of Brescia is, instead, lower than the regional and national average.



Employment rate (between 15 and 64 years) in the province of Brescia, Lombardy region, Italy.



Average income in the municipality of Brescia, in the province of Brescia, in the Lombardy region and in Italy. Year 2019.



Average income in the municipality of Brescia, in the province of Brescia, in the Lombardy region and in Italy. Year 2019.

Demographic characteristics of the reference population

Overall, from 2014 to 2022, the population at all territorial levels remained broadly stable, while decreasing slightly at the national level. The LHA (ASST) Spedali Civili di Brescia area was less affected by the population decrease.
The demographic structure by age groups is illustrated in the second Table below and in Figure "*Trend of Employment Rate"* on page 45 at the level of LHA (ASST) Spedali Civili di Brescia, LHA (ATS) of Brescia, regional and national in reference to the year 2022.
The province of Brescia has a population of 1,262,271 inhabitants in 2024, equivalent to 12.6% of the regional population.

The age composition of the population residing in the LHA (ASST) Spedali Civili di Brescia area and in the Province of Brescia presents a percentage of elderly population (from 65 years upwards) in line with the regional and national situation but higher than the hospital and provincial values.
The results obtained from the analysis of the population structure by age group are further confirmed by the trend of the main demographic indicators, whose dynamics over time allow us to study the variability in the territory of the phenomena related to the population and the respective demand for care.
The provincial territory of Brescia shows a decreasing trend in the birth rate in line with the Italian trend; the LHA (ASST) values are slightly lower than those of the Brescia and provincial LHA (ATS).

AGE / AREA	0-14 YEARS	15-64 YEARS	65+ YEARS
LHA of the Civil Hospitals of Brescia	66,542	324,778	116,837
ATS (Health Protection Agency) of Brescia	156,850	744,942	254,594
Province of Brescia	169,084	806,647	278,591
Lombardy Regional Government	1,300,215	6,356,662	2,308,169
Italy	7,476,667	37,460,096	14,046,359

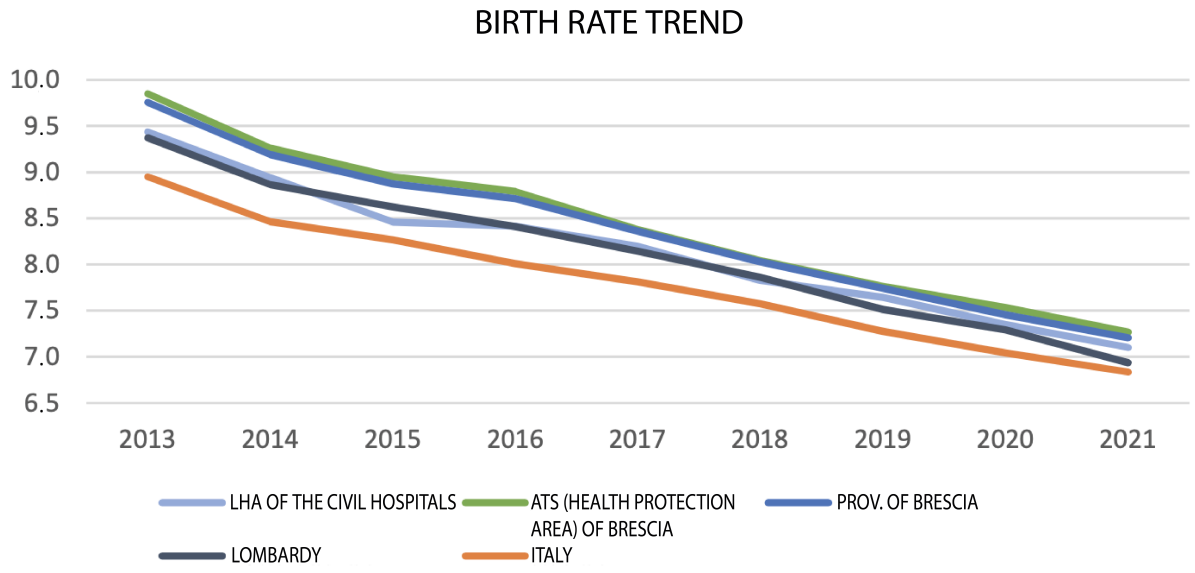
Structure of the population by age group: LHA (ASST) Spedali Civili di Brescia, LHA (ATS) of Brescia, Province of Brescia, Lombardy Region and in Italy. Year 2022.

DEMOGRAPHIC INDICATORS	DEFINITIONS
Birth rate	Ratio of the number of live births in the year to the average size of the resident population, multiplied by 1,000.
Mortality rate	Ratio of the number of deaths in the year to the average size of the resident population, multiplied by 1,000.
Total average age	The age-weighted average of the population for all the age groups.
Old-age ratio	Percentage ratio of the population aged 65 and over to the population aged 0-14.
Structural old-age dependency ratio	Percentage ratio of the population of non-working age (0-14 years and 65 years and over) to the population of working age (15-64 years).

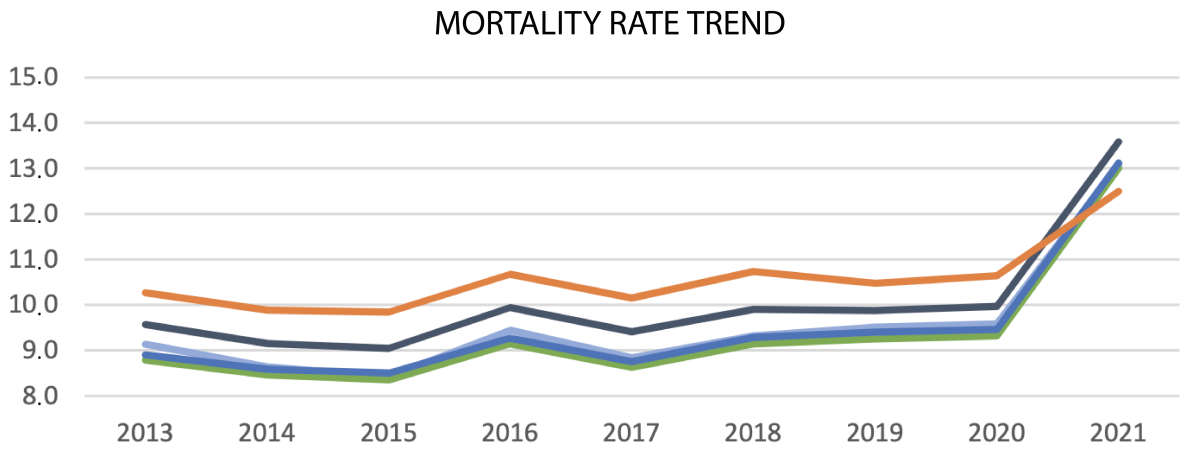
Definition of the demographic indicators analysed,

Trends observed for the mortality rate aligned on all territorial levels with small variations, except for 2021 (increase due to the COVID-19 pandemic). The LHA (ASST, ATS) and province of Brescia values are lower than regional and national levels. The dynamics of the two rates just analysed are reflected in the trend of average age, which has increased over the years for all five territorial levels of analysis. In 2022, the highest values were recorded at national level (47.2 years), followed in order by those for the Lombardy region (46.1 years), the province of Brescia (45.5 years), the LHA (ATS) Brescia (45.1 years) and the LHA (ASST) Spedali Civili di Brescia (45.0 years).
The old-age index is higher at LHA (ASST) level (175.6% in 2022), compared to the hospital and provincial level with a gap of 10.8 and 13.3 percentage points, respectively, while it has lower values than the regional and national levels (177.5% and 187.9% respectively).

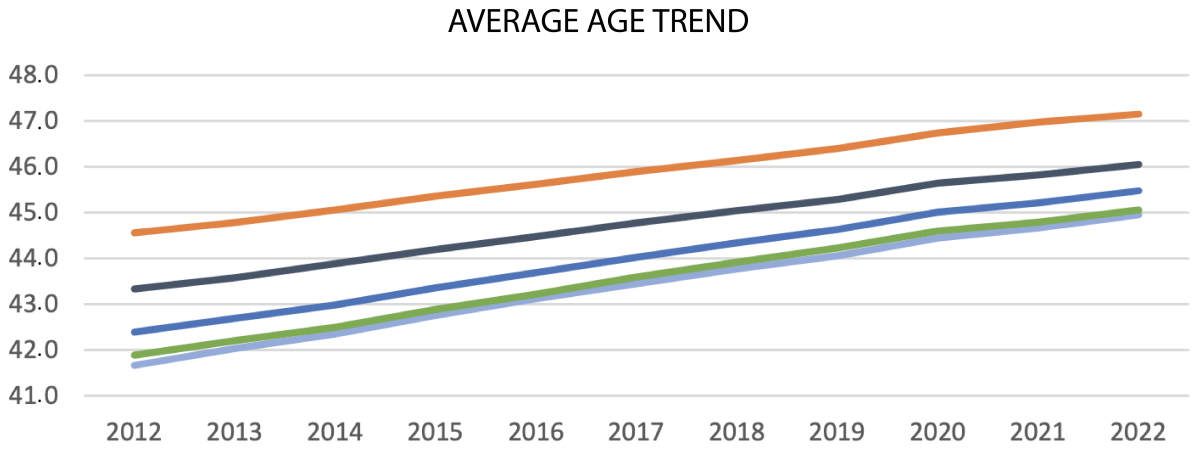
In summary, from the analysis of the population indices considered, it can be noticed that the Brescia area is characterised by a decreasing trend in the birth rate, in line with what is happening at regional and national level. The mortality rate shows an increasing trend between the years 2013- 2021 with lower values in the Brescia area than those recorded at higher territorial levels.
This is reflected in the average age of the resident population, which shows an increasing trend in the decade 2012-2022. Although the COVID-19 pandemic has slowed down the process of demographic ageing of the population of Brescia and Lombardy (with a significant reduction in life expectancy), the decrease in the birth rate and the increase in the average age remain, contributing to a progressive transformation in the age structure of the population, characterised by an increasing number of elderly people.



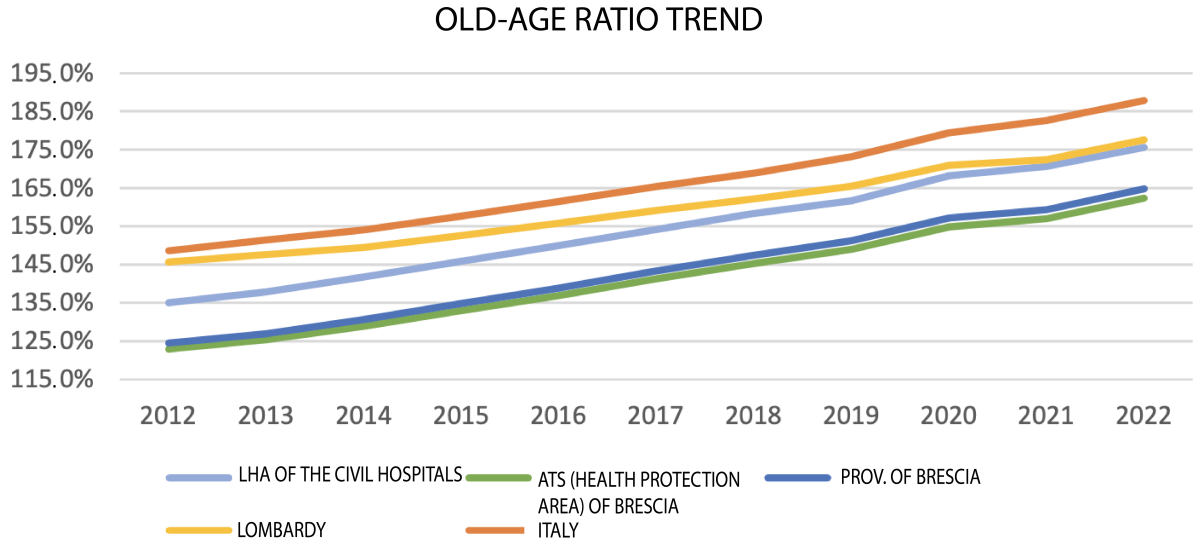
Birth rate - LHA (ASST) Spedali Civili di Brescia, LHA (ATS) of Brescia, Province of Brescia, Lombardy Region and in Italy. Period 2013-2021.



Mortality rate - LHA (ASST) Spedali Civili di Brescia, LHA (ATS) of Brescia, Province of Brescia, Lombardy Region and in Italy. Period 2013-2021.



Mean age - LHA (ASST) Spedali Civili di Brescia, LHA (ATS) of Brescia, Province of Brescia, Lombardy Region and in Italy. Period 2012-2022.



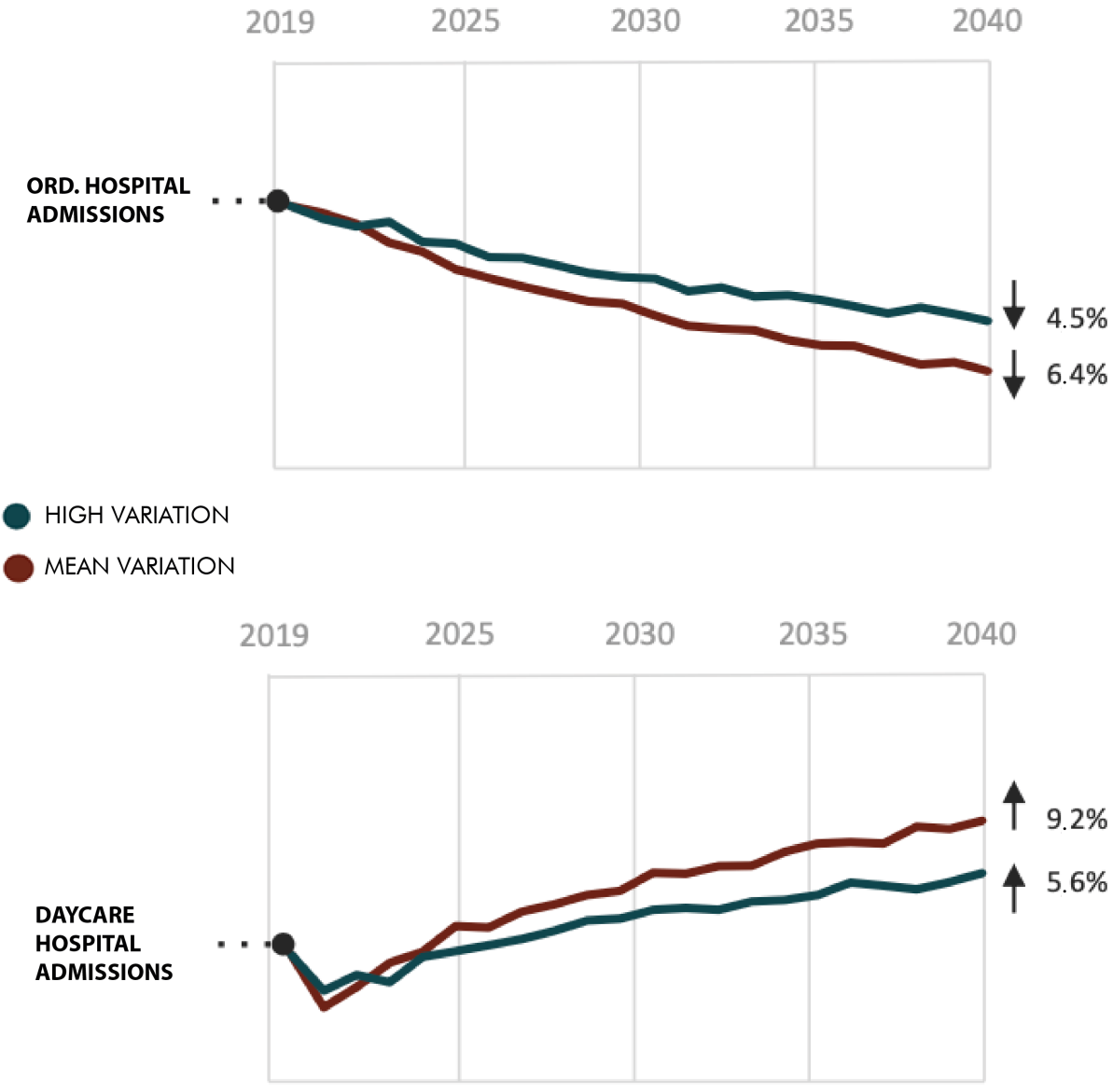
Old age index - LHA (ASST) Spedali Civili di Brescia, LHA (ATS) of Brescia, Province of Brescia, Lombardy Region and in Italy. Period 2012-2022.

Planned care provision

The redevelopment of the Brescia Hospital is completed as part of a project to reorganise the entire hospital network of the LHA (ASST), which aims to optimise the use of hospital beds for acute care.
In this regard, the reorganisation of hospital beds of LHA (ASST) hospitals is envisaged to restore the division of equipment between the areas of activity in order to meet the actual needs of the population served.

The methodological process followed to define these actions to reorganise the LHA (ASST) hospitals involved:

1. analysis of hospitalisation activity data for 2019 and updated to 2023;
2. partial alignment of hospitalisation days with the benchmark examined (Lombardy region); the average hospitalisation per individual Regional Council Decree was compared with the average hospitalisation recorded, in the same year, at Regional level; in cases where the average hospitalisation period in the hospitals analysed was higher than the



Estimated assessment of admissions to 2040.

benchmark, it was assumed that the excess hospitalisation days could be transferred to local facilities with lower care intensity;
3. application of the minimum standards defined by existing legislation in terms of minimum % of bed occupancy;
4. sizing of bed equipment;
5. verification of the estimated sizing based on forecast assessments of the reduction/ increase in the volume of services.

Although there is a decrease in ordinary admission activity in some Departments, the 2023 volumes do not represent a fully operational situation. Therefore, it was not considered appropriate to reduce the planned equipment of the new Hospital developed on the basis of 2019 data.

		ORDINARY BEDS	DH/DS BEDS	TECHNICAL BEDS	EQUIPMENT
MAIN HOSPITAL	Emergency and Admissions Department (DEA)			20	46
	MEDICAL INPATIENTS	348	6		
	SURGICAL INPATIENTS	250			
	INTENSIVE INPATIENTS	62			
	OPERATING AND INTER-VENT. BLOCK				27
	RADIOLOGY				21
	ENDOSCOPY				8
SUBTOTAL MAIN HOSPITAL		660	6	20	102
CANCER CENTRE	SURGICAL INPATIENTS	85			
	ONCO-HAEMATOLOGY IN-PATIENTS	54	3	68	
	RADIOTHERAPY	24			6
	NUCLEAR MEDICINE	4			5
SUBTOTAL CANCER CENTRE		167	3	68	11
LOW-CARE	SURGICAL INPATIENTS	58	28	34	
	OPERATING BLOCK				10
	PRE-RECOVERY				12
SUBTOTAL LOW-CARE		58	28	34	22
MEDICINE	TERRITORIAL MEDICINE	43			
	MENTAL HEALTH	23			1
SUBTOTAL MEDICINE		66			1
POST-ACUTE CARE	DCA	20			
SUBTOTAL POST-ACUTE CARE		20			
DAY HOSPITAL	RADIOLOGY				23
	OUTPATIENT CLINIC				220
	BLOOD COLLECTION AREA				30
	REHABILITATION				17
	DIALYSIS			30	4
SUBTOTAL DAY HOSPITAL				30	294
BIRTH CENTRE	OBSTETRICS EMERG. DEPT.			2	7
	OBSTETRICS INPATIENTS	60			
	NEONATAL INPATIENTS	25		16	
	NEONATAL INTENSIVE IN-PATIENTS	18			
	CHILDBIRTH BLOCK				8
	OUTPATIENT CLINIC				11
SUBTOTAL BIRTH CENTRE		103		18	26
CHILDREN'S HOS-PITAL	PAEDIATRIC EMERG. DEPT.			8	16
	PAEDIATRIC AND SURGERY INPATIENTS	79	7	11	2
	INTENSIVE INPATIENTS	5			
	OPERATING BLOCK				4
	RADIOLOGY				7
	OUTPATIENT CLINIC				21
SUBTOTAL CHILDREN'S HOSPITAL		84	7	19	50
	PAYING PATIENTS			15	
TOTAL		1,148	44	204	506

Total equipment of the New Brescia Hospital

Starting from the admission activity data for the year 2019 ("AS-IS"), the days of hospitalisation provided by acute care wards and potentially transferable to lower care intensity settings have been estimated. The assessment involved ordinary admissions to the Medical Area (which revealed a future increase in high (9.2%) and medium (5.6%) intensity day admissions and a reduction in ordinary admissions), the Psychiatric Area and the Surgical Area; admissions to the Children's Hospital were excluded from the assessment. Overall, there are 16,050 days of hospitalisation of the Spedali Civili di Brescia Hospital potentially transferable to the territory, 3,096 days of the Hospital of Gardone Val Trompia and 4,537 days of the Hospital of Montichiari.

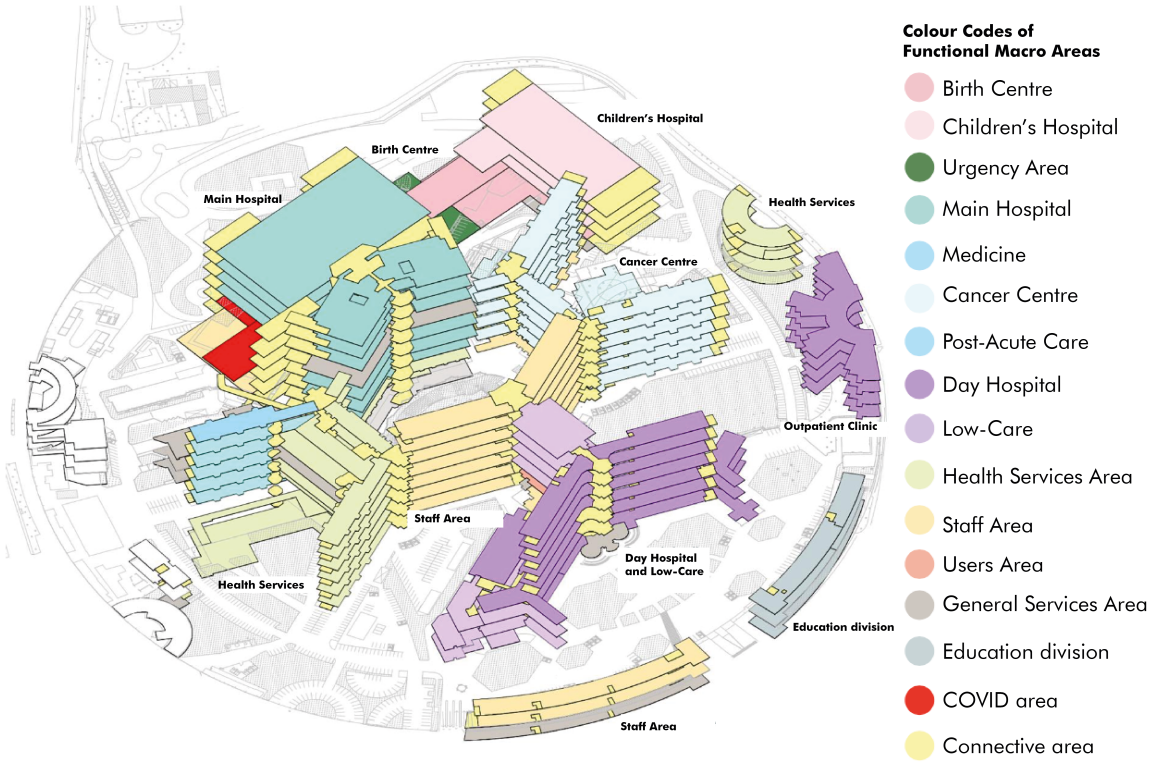
Applying to the "optimised" days of hospitalisation (activity volume minus the days potentially transferable to territorial offer units) the minimum standards defined by current legislation, i.e., an occupancy rate of hospital beds of at least 85%, we obtain the size of the beds in the project status ("TO-BE") reported in the Table below:

- Spedali Civili di Brescia Hospital: 1,082 beds;
- Children's Hospital: 89 beds;
- Gardone Val Trompia Hospital: 112 beds;
- Montichiari Hospital: 130 beds.

The reorganisation of the LHA (ASST) hospital network and, in particular, the transfer of part of the admission activity from acute care wards to territorial offer units must be accompanied by the reorganisation of the offer of territorial delivery hubs that will be called upon to operate in full harmony and synergy with the new hospital network.

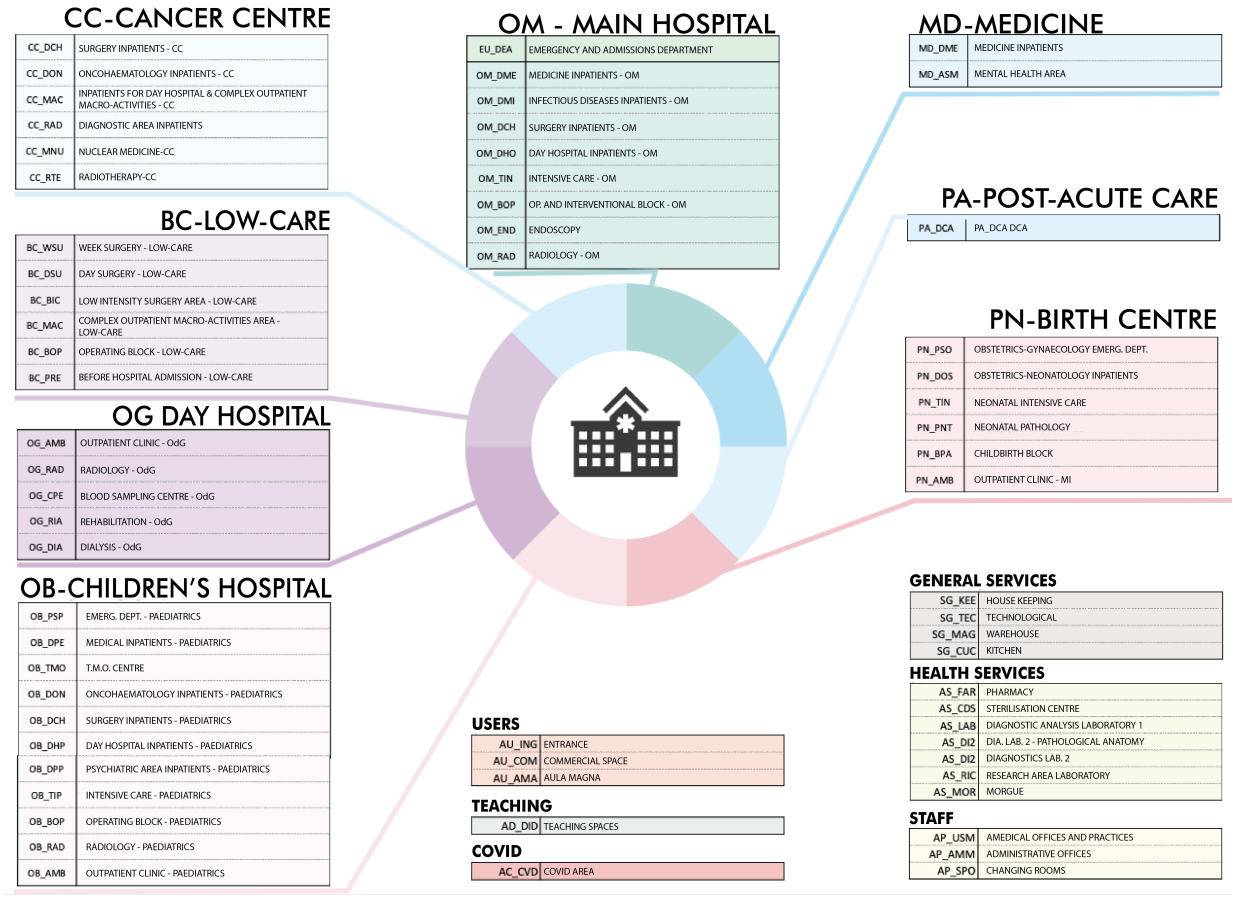
To this end, the necessary need for non-hospital beds, equal to 75 units, to be included in the relevant delivery network, was estimated, as a strategic resource for proactively taking charge and managing care pathways for chronic and frail patients, in synergy with acute care hospitals.

Furthermore, as indicated in the above Tables, the efficiency of the activity of acute care wards can only be enhanced by an activity of streamlining



New reorganisation of the functional areas of the Hospital. The volumes depicted are for illustrative purposes only, and are not indications or functional, volumetric or dimensional references.

and reorganising the clinical care pathways aimed at reducing the average hospitalisation period (mainly in the specialities of the medical area) by about -10% and -15%.
The new organisation model exemplified in the following diagram completely redesigns the use of spaces in the north-south direction. It redefines pathways for increasing care settings, and moves outside the hospital walls activities that the pandemic has taught us to stop performing in hospital. A new type of hospitalisation is proposed with an organisational model comprising five units, going beyond the old obsolete triple-unit model.
The organisation model was implemented with an approach oriented towards the definition of eight centres gradually organised by intensity of care, following the north-south direction of the hospital. The functional areas are given below, grouped into the eight identified centres and a further division of the functional macro-areas envisaged in the reorganisation of the hospital complex (including healthcare, general, staff, users, teaching and Covid areas).



Structure of the new eight clusters of functional areas.

Evolutionary trends in hospital construction

Re-thinking the Health Architecture project

The Architecture project has always been an opportunity to translate into spatial physicality the multiple challenges posed by contemporary society. In particular, Health Architectures are the place where the most disruptive social, economic and environmental global trends must find a dedicated spatial, functional and technological synthesis, often interacting with consolidated cultural, morphological and urban contexts.
The hospital is an architectural typology that can be said to have always existed, and which has gone through historical periods transforming itself, even radically, but defining a clear evolutionary succession. Indeed, the hospital is the type of building that more than any other acquires the characteristics of a "social" architecture or that accepts and translates into architecture (spatial physicality) a series of political, economic, social, organisational, epidemiological, environmental, ecological, functional and relational requests. Hence it turns out to be an architecture that allows you to reread the history of its morpho-typological transformation in the light of the evolution of society, medicine and technology, and to outline future development trends.
From the close link with nature and the link with the otherworldly life of the first hospitals, through the differentiation between healthy and sick bodies of medieval hospitals, to the mechanisation of the hospital to treat a different part of the body in each building, hospital architecture provides evidence of a clear cultural and social approach to care, strongly mediated by the technological advancement of the period. This is how, for example, the possibility of vertical expansion and increasing complexity of the hospital engineering systems contributes to establishing what we now know as the "monoblock" type, and which make up the majority of the existing hospital stock in Europe. Thanks to technological progress, genetic code research and personalised medicine, these rigid and extremely functional models gradually open up to contamination and hybridisation towards more horizontally developed hospital systems with specialised building compositions integrated with the context.

Hence, today we need to re-think the hospital project with operational strategies for the hospital of the future that carefully interpret the global transformations of population ageing, social inclusion, digitisation and artificial intelligence, climate change and sustainability, considered from a holistic perspective.
Among the many healthcare facilities, the Acute Care Hospital is, therefore, the most complex for its morphological, spatial and functional organisation. It is influenced by the presence of different users with multiple needs. The hospital is, in practice, a "city in the city" where multiple functions find space and relationships in a single complex infrastructure.
Hence the need to note its state of health, underscoring how the widespread technological components, the lack of significant investments and the highly complex management of the hospital have contributed to slowing down research on the architectural, morpho-typological and construction aspects of these infrastructures. In particular, it is estimated that, compared to an optimal life cycle of about 50 years, 70% of European hospitals are obsolete, and 50% are not adequate to accommodate present day organisational models. This rate of obsolescence stems from the inability of an excessively rigid structure to accompany the sudden changes and modifications required by the evolution of processes and technologies. Moreover, considering the extensive time required to design and build such a complex infrastructure (an average of 10-20 years is estimated in Europe), the risk of "opening an already old hospital" is very high.
New meta project models and frameworks are, therefore, needed to help identify the correct sizing, functional and spatial relationships, and performance requirements that a forward-looking hospital must meet.
Finally, it is necessary to measure the qualities of a hospital and to identify Key Performance Indicators (KPIs) for each theme area that can convey contemporary hospitals towards true new generation models (Next Generation Hospitals), which are functional, sustainable, digital, safe, inclusive and networked with the territory to effectively intercept the healthcare needs of the future.

> Evolution of hospital architectures

SIGN OF GODS

IV century BC

SIGN OF BODIES

14th century AD

Asklepieion of Kos

Valetudinarium Novaesium

Hotel de Dieu

Ca' Granda

Hôpital Lariboisière

Presbyterian Hospital

Asklepieions

Temples dedicated to the god Asclepius. They were isolated places that had the dual function of place of care and sanctuary.

Valetudinarium

Infirmaries, initially military, born under Emperor Augustus when he created the permanent army.

Institutes for Care and Hospitalisation

With the advent of Christianity, we are witnessing the real turning point of these institutions. For the first time, spaces adjacent to religious spaces are built or intended for "pilgrims and the needy". These spaces take the form of hospitals, specifically intended to provide generic care to those who need it.

First hospitals

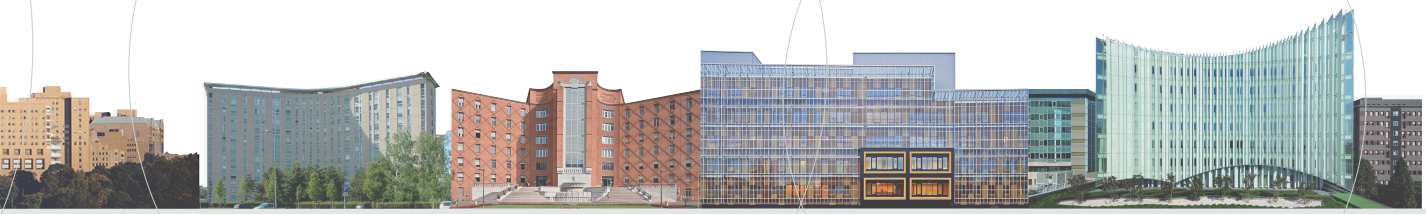
The aim of this period was to separate the sick and their bodies from the healthy by reporting the illness.
Spaces for infected patients (lazarets and leper hospitals) and hospitals were thus created.
Hospitals were dedicated to the uninfected, and were beginning to separate men and women, chronically ill patients and acute care patients.

SIGN OF MACHINES

18th century AD

SIGN OF CODES

20th century AD



San Paolo Hospital

Spedali Civili di Brescia

Martini Hospital

New Surgical and Urgency Centre, San Raffaele Scientific Institute for Hospitalisation and Care (IRCCS)

Hospitals with multiple buildings

Facilities divided by diseases, which begin to be classified in this period.

Monoblock hospitals

Construction of hospitals with less land usage, shorter distances, more efficiency and less construction costs.

Hospitals with multiple blocks

Better relationship with the environment, height not too high and possible expansive flexibility.

Sector-Tower Hospitals

Sector usually including a few floors with general services and polyclinics for diagnostics, tower with inpatients.

Contemporary Hospitals

Contemporary hospital design provides more space for diagnostic services, intensive care, resuscitation, emergency department, analysis and research laboratories, day-hospital, day-surgery and services.
It is structured as a scientific and technological centre, a centre for diagnosis and treatment, prevention and study, specialisation and research.

2

VISION AND GOALS

The chapter summarises the vision of LHA (ASST) Spedali Civili di Brescia for a new model of hospital capable of meeting social needs with cutting-edge services in an efficient, flexible and future-oriented infrastructure. The quality of hospitality and openness to the needs of the territory are an intrinsic part of the mission of the New Brescia Hospital, precisely to be safe, adaptable and sustainable.

Vision and Goals

The LHA (ASST) Spedali Civili di Brescia is a landmark for the health and well-being of people, undertaking to respond effectively and promptly to the healthcare needs of those who contact its facilities. A distinctive element of Spedali Civili di Brescia is the integration of **care, teaching and research**, with a view to a holistic approach that takes into account not only the clinical aspects, but also the psychological and social needs of patients.

The hospital also operates in compliance with fundamental principles such as effectiveness and efficiency of services, continuity of care, quality and appropriateness of care, transparency in decision-making processes and legality. In addition, there is a strong commitment to protect the environment and hospital heritage, aware that a sustainable healthcare system is essential for the well-being of present and future generations. These values are the constant reference for all activities of the LHA (ASST) Spedali Civili, directing every action towards excellence in care and research, with the aim of improving the quality of life of both people and the community.

The project aims to renew and upgrade the current hospital, overcoming the critical infrastructural issues in the management of the most complex areas, and ensuring a modern, flexible and efficient layout. Considering the facility's important national role and its function as a university, the project aims to create a state-of-the-art hospital, capable of responding promptly to future medical challenges and any healthcare emergencies.

The main objective is to redefine hospital organisation by focusing on adult and paediatric patients, moving beyond the traditional speciality-based model to adopt an innovative approach based on integrated centres, with greater sharing of human, structural and technological resources. In particular, the new hospital is configured as an innovative next generation complex infrastructure in which emergency-urgency management and surgery activities are integrated with an ordinary and paediatric patient management structure. The Main Hospital is dedicated to the care of patients of the Surgical and Medical Area with medium-high intensity of care, mainly in an emergency-urgency regime and ordinary admissions regime. This space also includes intensive and sub-intensive care units, Emergency and Admissions Department (DEA), surgical and interventional block, diagnostic imaging and endoscopic sector. The Children's Hospital will consist of a part dedicated to the Maternal-Infant area (pregnant women, births and babies), and a second part will be dedicated to hospitalisations and paediatric diagnostics. The new hospital complex will strengthen the infrastructural layout of the LHA (ASST) Spedali Civili, regenerating and enhancing the existing hospital complex.

Specifically, the project involves:

- the implementation of a modern emergency-urgency system (DEA) to ensure timely and effective responses.
- The creation of a new reception system in the North, to improve accessibility and patient experience.
- The implementation of an innovative care and admissions system, through the construction of multifunctional facilities or sectors that ensure the clear separation of care paths.
- The design and construction of a new Children's Hospital, entirely dedicated to paediatric care, to guarantee specific and highly specialised care.

This renewal plan is a unique opportunity to rethink the Brescia Hospital in a modern way, **improving efficiency, quality of care and the overall patient experience** by designing new state-of-the-art facilities integrated into the redesign of the overall masterplan for the Spedali Civili complex.

3

TECHNICAL, SPATIAL AND FUNCTIONAL REQUIREMENTS

The chapter defines the main functional and design requirements the intervention must meet. Specifications relating to the rough sizing of functional areas, their equipment as well as the main design ideas supported by best practices and international scientific literature are described in detail.

Functional Plan

Introduction

The chapter describes **the functional programme** of the new hospital complex that will be located within the Spedali Civili di Brescia complex. The objective of this chapter is to define the structural, functional and operational needs of the new hospital by sizing the newly built macro-areas in the context of a broader rethinking of the project masterplan. In fact, the new intervention is designed to meet a growing demand for advanced healthcare services, in line with the needs of a constantly evolving population. The need for a New Hospital Complex within the existing hospital stems from the need to update and upgrade the existing infrastructure, in order to respond to the challenges of modern healthcare, characterised by an increase in the demand for complex and specialised treatments, and a stressful emergency-urgency activity. The creation of new spaces dedicated to intensive care, emergency departments and hospitalisations will allow for a greater number of patients, reducing waiting times and improving the quality of care within a complex project of functional reorganisation by intensity of care. In addition, the new block will house the **Children's Hospital**, with an area dedicated to paediatric and maternal-infant activities, thus meeting the need for adequate and high quality healthcare for these vulnerable groups. The integration of these areas into a single hospital block optimises flows and ensures maximum operational efficiency, while maintaining a highly specialised and safe environment. In this context, the functional programme focuses on defining the size of the areas and equipment required for each department, as well as establishing the functional and spatial relationships between the different hospital areas, to promote integrated and coherent design. This approach will ensure the creation of a hospital that is capable of facing future healthcare challenges, capable of providing excellent care and of responding to the needs of an ever evolving community. The organisation of hospital macro-areas is divided into two main sectors: the **Main Hospital** (MH), dedicated to the main medical and surgical specialisations, and the **Children's Hospital** (CH), aimed at providing care for paediatric patients. Each area has been designed to meet clinical, organisational and logistic needs, with particular attention to the separation of patient, staff and supply flows, to improve the efficiency and safety of the hospital environment.

Methodology

The methodology proposed for the functional organisation of the New Hospital Complex involves the division of the hospital into distinct macro-areas, each with a specific functional identity, but closely integrated with the others to ensure continuity of the care pathways through the definition of spatial and functional matrices. The macro-areas considered for the definition of the functional programme refer to the meta-project **Next Generation Hospital®**, of the research platform JRP Healthcare Infrastructures of the Politecnico di Milano.
The following elements will be defined for each macro-area:

- **General Requirements:** A brief description of the functions of its services will be provided for each macro-area.
- **Estimated Main Equipment and Sizing:** The preliminary sizing of the spaces will be defined based on the planned capacity and the main equipment envisaged, such as the number of beds for inpatients, operating theatres, clinics, and other specific facilities.
- **Functional and Spatial Relations:** the connections and the different spatial and functional relationships between the areas will be defined. Spatial and functional relationships are essential to ensure efficient flows, both for staff and patients, and to optimise the use of resources. The interconnections will have to meet specific operational needs, such as proximity between emergency areas and operating theatres or between maternity and neonatal intensive care areas. Spatial relationships will help minimise travel times, thus improving operational efficiency and reducing the risk of interference between different workflows.

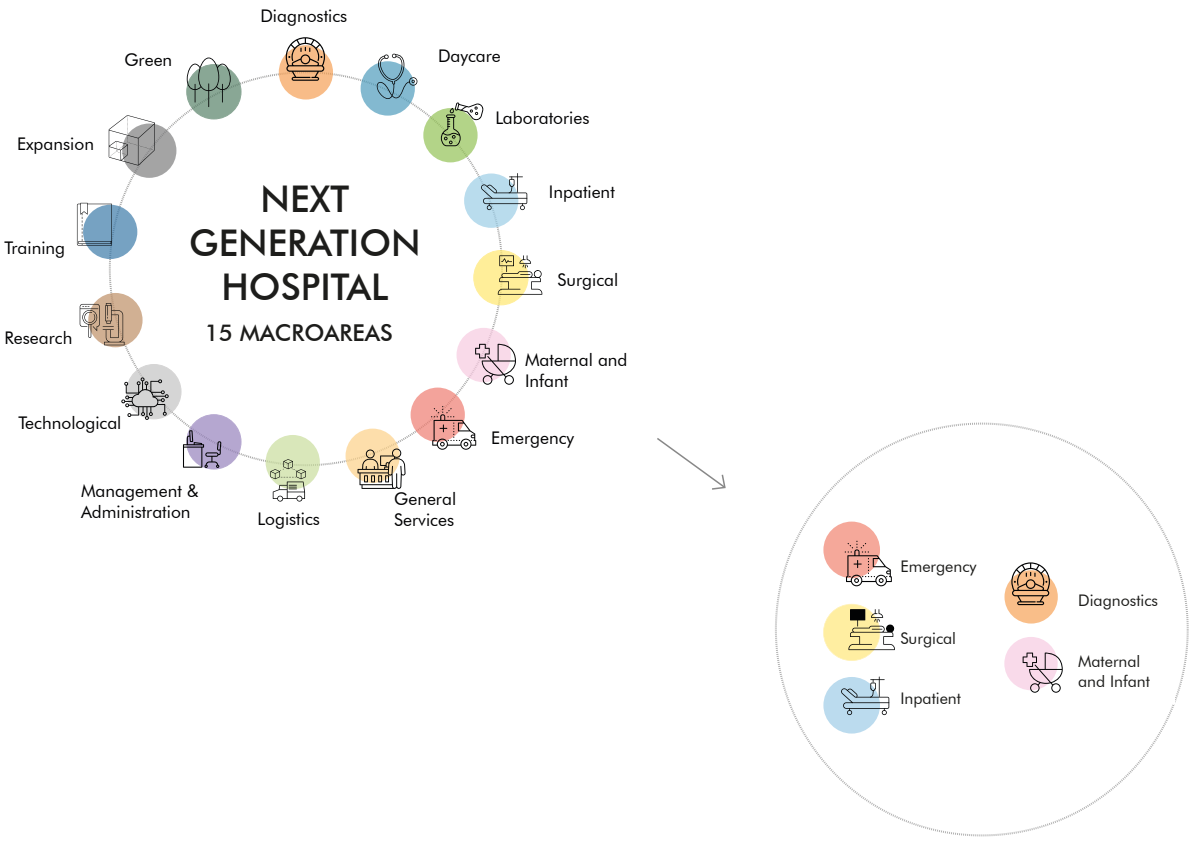
Relationship with existing facilities and masterplans

The project is part of a broader project, which includes the construction of the New Hospital Complex, in the Main Hospital (MH) and Children's Hospital (CH), in Phase 1, and rethinking the functional aspects of the existing one in Phase 2. Given the overall nature of the intervention, it is necessary to consider not only the functions of Phase 1, but also the connections that will have to follow with Phase 2 to implement the interventions and subsequently, the Spedali Civili di Brescia Hospital Complex, a single harmonious system.

In particular, the need to enhance connections with the main Surgical Block, the Diagnostic Area, the Laboratory Area and the Day Area is highlighted. In this regard, see Chapters 1 and 5 for the analysis of the constraints of connection with the previously existing aspects.

It is also necessary to consider the connections with the areas that will be allocated to the functions of the Central Changing Room for employees, the Teaching Campus and the Departmental Areas dedicated to administrative services. These areas will be placed within the existing ones, which will be the subject of intervention and functional redevelopment during Phase 2 of the intervention.

Areas of the Next Generation Hospital explored in greater depth in the Project design Document (DIP)



SIZING OF INTERVENTION AREAS	sq.m
STEP 1	26,880
STEP 2	23,500
TOTAL AREA OF INTERVENTION	**50,380**
TOTAL DEMOLITIONS (SLP)	**85,000**

SUMMARY OF SIZING OF THE NEW HOSPITAL COMPLEX	sq.m*	%*
MAIN HOSPITAL	40,800	69%
CHILDREN'S HOSPITAL	19,700	31%
TOTAL	**60,500****	**100.00%**

*The dimensional parameter indicated is not mandatory, but a starting point to be developed according to the specific needs expressed by the contracting authority.
** Area including connective sites, façades and technological rooms

MACRO-AREAS OF THE NEW HOSPITAL COMPLEX	sq.m*	%*
INPATIENT AREA *Main Hospital inpatient area* *Children's Hospital inpatient area*	26,000	43% *33%* *10%*
MATERNAL AND INFANT AREA	6,500	11%
EMERGENCY AREA *Emergency-Urgency Area - Main Hospital* *Emergency-Urgency Area - Children's Hospital*	11,500	19% *16%* *3%*
DIAGNOSTIC AND THERAPY AREA *Diagnostic area - Main Hospital* *Diagnostic area - Children's Hospital*	3,300	5% *3%* *2%*
SURGICAL AREA *Surgical area - Main Hospital* *Surgical area - Children's Hospital*	6,200	10% *7%* *3%*
Total net of technical rooms	*53,500*	*88%*
TOTAL	**60,500****	**100%**

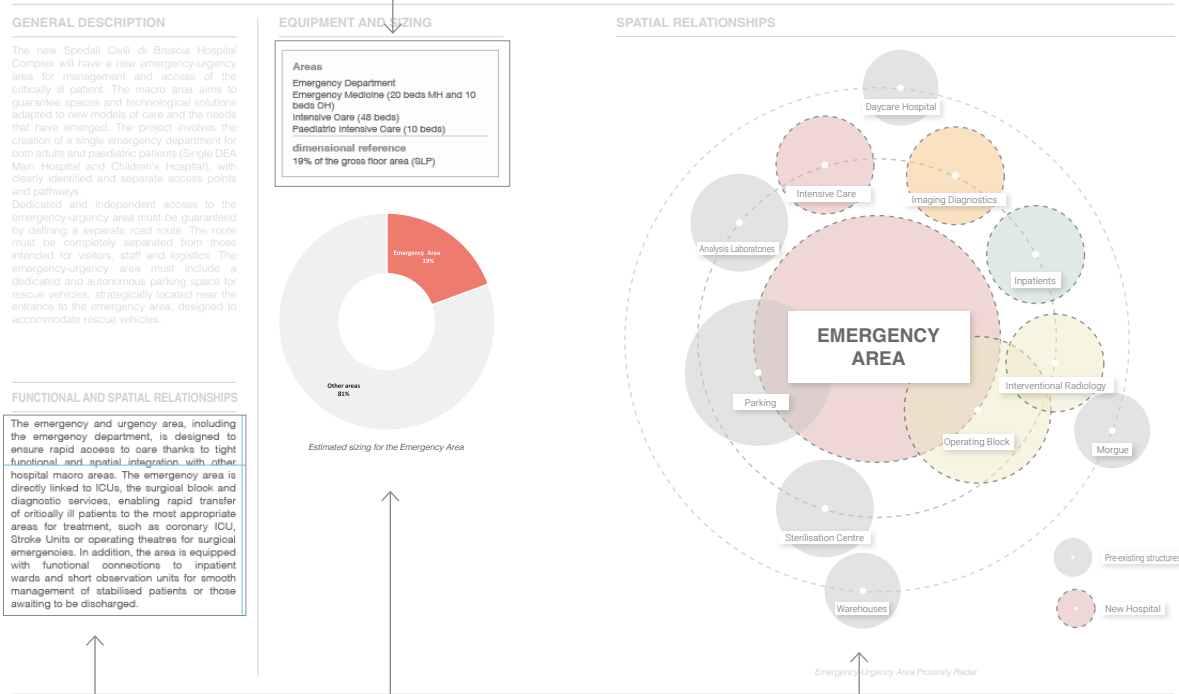
*The dimensional parameter indicated is not mandatory, but a starting point to be developed according to the specific needs expressed by the contracting authority.
** Area including connective sites, façades and technological rooms

> Reading Guide

To facilitate interpreting the various macro areas (indicated in the diagram below), the following is a summary diagram with the information provided in each sheet.

Title
Name of the area described in the sheet

Equipment and sizing
Specifications regarding dimensional references or characteristics and specifications of the areas in question



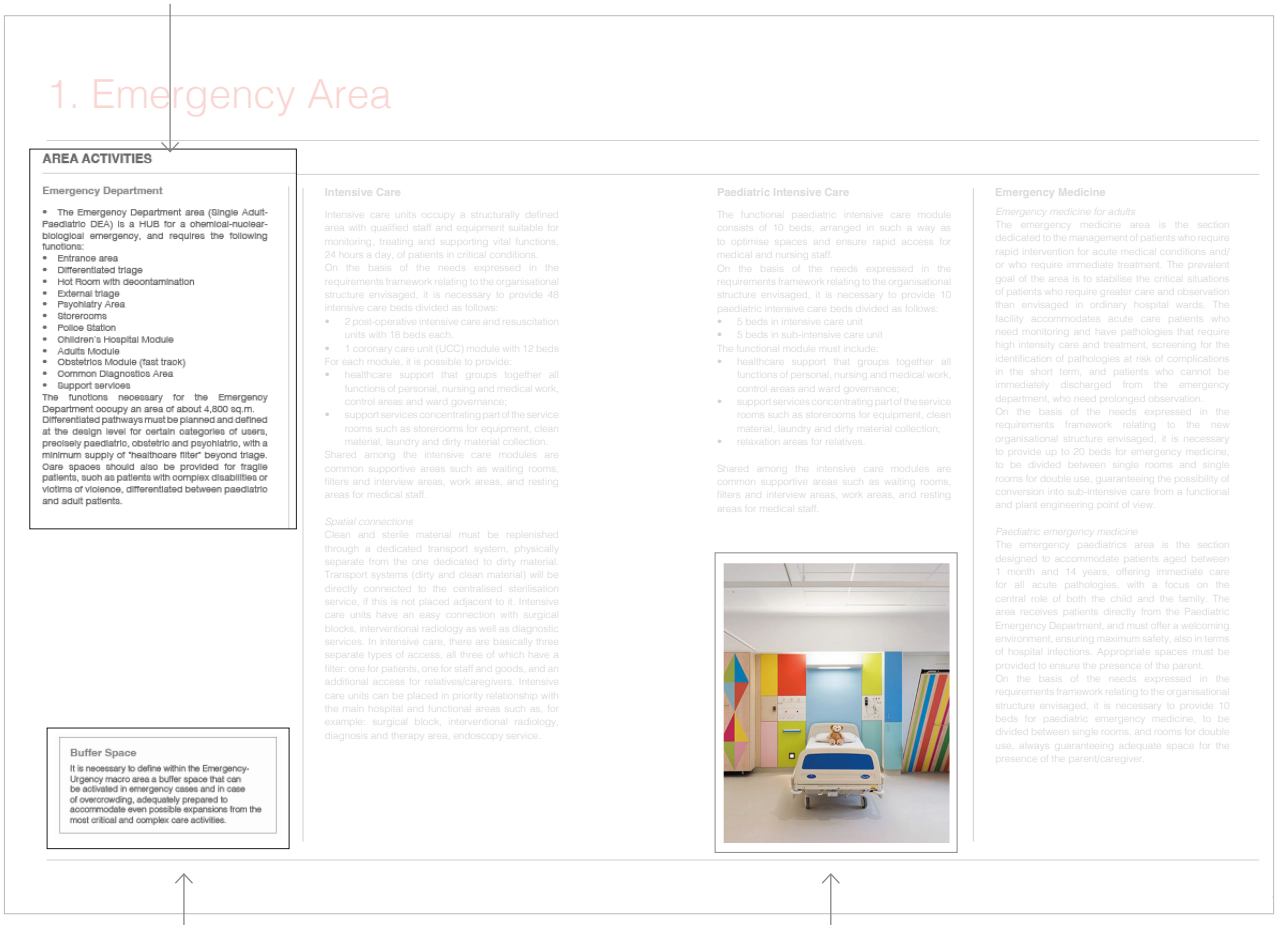
Requirements
Textual description of general, functional and spatial requirements

Pie chart
Dimensional reference that visually translates the textual reference

Radar
Radar graph identifying the possible level of proximity of the various Functional Areas

Environmental Units

Description of the different environmental units contained in each area analysed in the sheets



1. Emergency Area

AREA ACTIVITIES

Emergency Department

- The Emergency Department area (Single Adult-Paediatric DEA) is a HUB for a chemical-nuclear-biological emergency, and requires the following functions:
- Entrance area
- Differentiated triage
- Hot Room with decontamination
- External triage
- Psychiatry Area
- Storerooms
- Police Station
- Children's Hospital Module
- Adults Module
- Obstetrics Module (fast track)
- Common Diagnostics Area
- Support services

The functions necessary for the Emergency Department occupy an area of about 4,800 sq.m. Differentiated pathways must be planned and defined at the design level for certain categories of users, precisely paediatric, obstetric and psychiatric, with a minimum supply of "healthcare filter" beyond triage. Care spaces should also be provided for fragile patients, such as patients with complex disabilities or victims of violence, differentiated between paediatric and adult patients.

Buffer Space

It is necessary to define within the Emergency-Urgency macro area a buffer space that can be activated in emergency cases and in case of overcrowding, adequately prepared to accommodate even possible expansions from the most critical and complex care activities.

Intensive Care

Intensive care units occupy a structurally defined area with qualified staff and equipment suitable for monitoring, treating and supporting vital functions, 24 hours a day, of patients in critical conditions.
On the basis of the needs expressed in the requirements framework relating to the organisational structure envisaged, it is necessary to provide 48 intensive care beds divided as follows:

- 2 post-operative intensive care and resuscitation units with 18 beds each.
- 1 coronary care unit (UCC) module with 12 beds

For each module, it is possible to provide:

- healthcare support that groups together all functions of personal, nursing and medical work, control areas and ward governance;
- support services concentrating part of the service rooms such as storerooms for equipment, clean material, laundry and dirty material collection.

Shared among the intensive care modules are common supportive areas such as waiting rooms, filters and interview areas, work areas, and resting areas for medical staff.

Spatial connections

Clean and sterile material must be replenished through a dedicated transport system, physically separate from the one dedicated to dirty material. Transport systems (dirty and clean material) will be directly connected to the centralised sterilisation service, if this is not placed adjacent to it. Intensive care units have an easy connection with surgical blocks, interventional radiology as well as diagnostic services. In intensive care, there are basically three separate types of access, all three of which have a filter: one for patients, one for staff and goods, and an additional access for relatives/caregivers. Intensive care units can be placed in priority relationship with the main hospital and functional areas such as, for example: surgical block, interventional radiology, diagnosis and therapy area, endoscopy service.

Paediatric Intensive Care

The functional paediatric intensive care module consists of 10 beds, arranged in such a way as to optimise spaces and ensure rapid access for medical and nursing staff.
On the basis of the needs expressed in the requirements framework relating to the organisational structure envisaged, it is necessary to provide 10 paediatric intensive care beds divided as follows:

- 5 beds in intensive care unit
- 5 beds in sub-intensive care unit

The functional module must include:

- healthcare support that groups together all functions of personal, nursing and medical work, control areas and ward governance;
- support services concentrating part of the service rooms such as storerooms for equipment, clean material, laundry and dirty material collection;
- relaxation areas for relatives.

Shared among the intensive care modules are common supportive areas such as waiting rooms, filters and interview areas, work areas, and resting areas for medical staff.

Emergency Medicine

Emergency medicine for adults

The emergency medicine area is the section dedicated to the management of patients who require rapid intervention for acute medical conditions and/or who require immediate treatment. The prevalent goal of the area is to stabilise the critical situations of patients who require greater care and observation than envisaged in ordinary hospital wards. The facility accommodates acute care patients who need monitoring and have pathologies that require high intensity care and treatment, screening for the identification of pathologies at risk of complications in the short term, and patients who cannot be immediately discharged from the emergency department, who need prolonged observation.
On the basis of the needs expressed in the requirements framework relating to the new organisational structure envisaged, it is necessary to provide up to 20 beds for emergency medicine, to be divided between single rooms and single rooms for double use, guaranteeing the possibility of conversion into sub-intensive care from a functional and plant engineering point of view.

Paediatric emergency medicine

The emergency paediatrics area is the section designed to accommodate patients aged between 1 month and 14 years, offering immediate care for all acute pathologies, with a focus on the central role of both the child and the family. The area receives patients directly from the Paediatric Emergency Department, and must offer a welcoming environment, ensuring maximum safety, also in terms of hospital infections. Appropriate spaces must be provided to ensure the presence of the parent.
On the basis of the needs expressed in the requirements framework relating to the organisational structure envisaged, it is necessary to provide 10 beds for paediatric emergency medicine, to be divided between single rooms, and rooms for double use, always guaranteeing adequate space for the presence of the parent/caregiver.

Specifications

Any specifications (e.g., references or equipment) of each environmental unit

Case study

Photograph of a reference case study with respect to the environmental unit described

1. Emergency Area

GENERAL DESCRIPTION

The new Spedali Civili di Brescia Hospital Complex will have a new emergency-urgency area for management and access of the critically ill patient. The macro area aims to guarantee spaces and technological solutions adapted to new models of care and the needs that have emerged. The project involves the creation of a single emergency department for both adults and paediatric patients (Single DEA Main Hospital and Children's Hospital), with clearly identified and separate access points and pathways.
Dedicated and independent access to the emergency-urgency area must be guaranteed by defining a separate road route. The route must be completely separated from those intended for visitors, staff and logistics. The emergency-urgency area must include a dedicated and autonomous parking space for rescue vehicles, strategically located near the entrance to the emergency area, designed to accommodate rescue vehicles.

FUNCTIONAL AND SPATIAL RELATIONSHIPS

The emergency and urgency area, including the emergency department, is designed to ensure rapid access to care thanks to tight functional and spatial integration with other hospital macro areas. The emergency area is directly linked to ICUs, the surgical block and diagnostic services, enabling rapid transfer of critically ill patients to the most appropriate areas for treatment, such as coronary ICU, Stroke Units or operating theatres for surgical emergencies. In addition, the area is equipped with functional connections to inpatient wards and short observation units for smooth management of stabilised patients or those awaiting to be discharged.

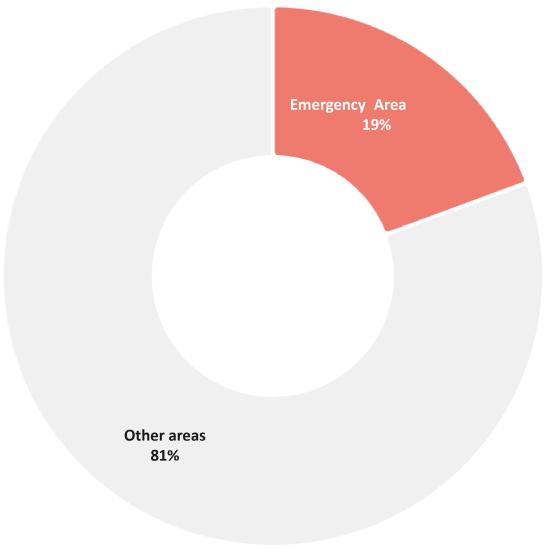
EQUIPMENT AND SIZING

Areas

Emergency Department
Emergency Medicine (20 beds MH and 10 beds CH)
Intensive Care (48 beds)
Paediatric Intensive Care (10 beds)

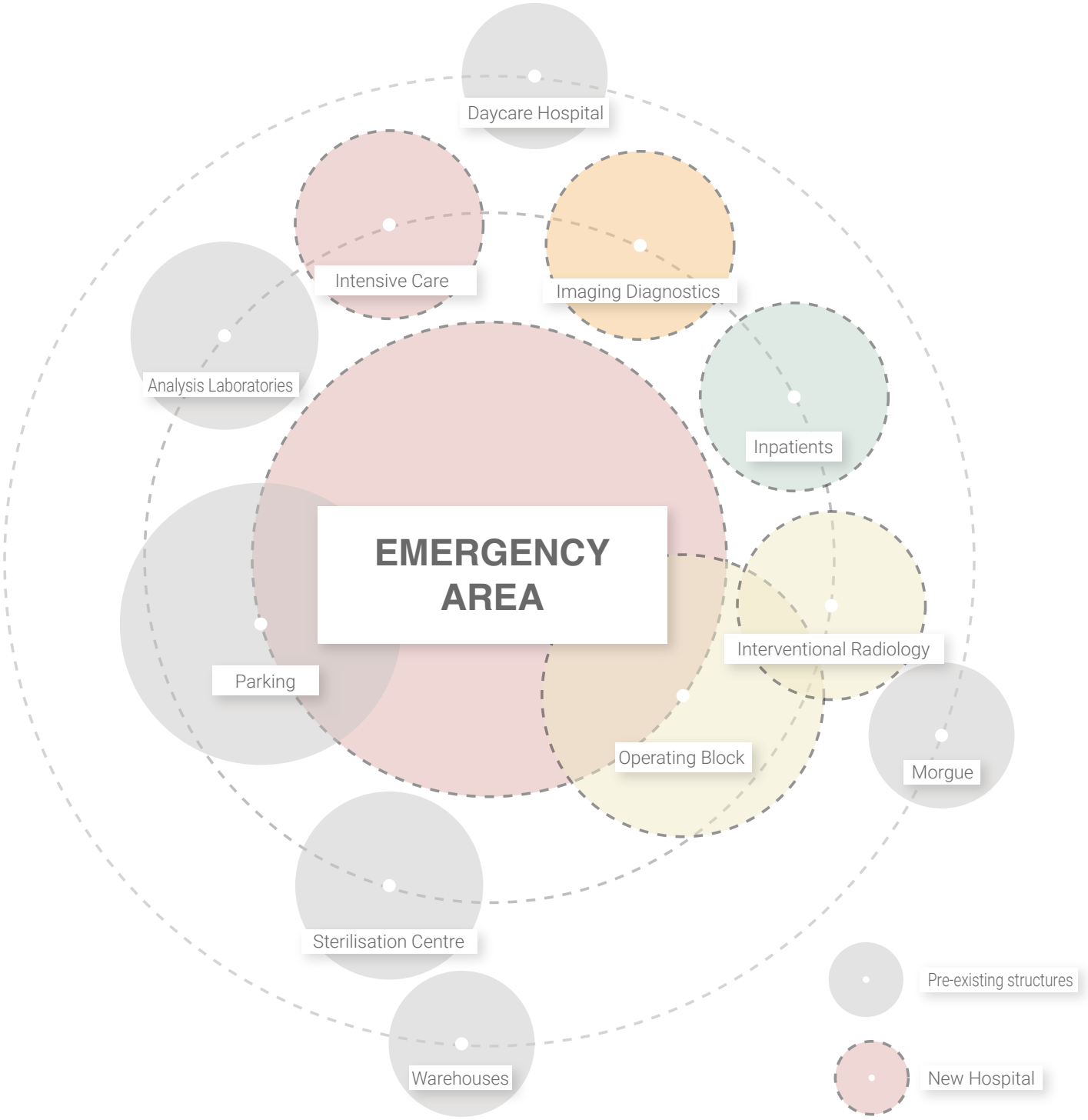
dimensional reference

19% of the gross floor area (SLP)



Estimated sizing for the Emergency Area

SPATIAL RELATIONSHIPS



Emergency-Urgency Area Proximity Radar

1. Emergency Area

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The functions necessary for the Emergency Department occupy an area of about 4,800 sq.m.
Differentiated pathways must be planned and defined at the design level for certain categories of users, precisely paediatric, obstetric and psychiatric, with a minimum supply of "healthcare filter" beyond triage. Care spaces should also be provided for fragile patients, such as patients with complex disabilities or victims of violence, differentiated between paediatric and adult patients.

Buffer Space

It is necessary to define within the Emergency-Urgency macro area a buffer space that can be activated in emergency cases and in case of overcrowding, adequately prepared to accommodate even possible expansions from the most critical and complex care activities.

Intensive Care

Intensive care units occupy a structurally defined area with qualified staff and equipment suitable for monitoring, treating and supporting vital functions, 24 hours a day, of patients in critical conditions.
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For each module, it is possible to provide:

- healthcare support that groups together all functions of personal, nursing and medical work, control areas and ward governance;
- support services concentrating part of the service rooms such as storerooms for equipment, clean material, laundry and dirty material collection.

Shared among the intensive care modules are common supportive areas such as waiting rooms, filters and interview areas, work areas, and resting areas for medical staff.

Spatial connections
Clean and sterile material must be replenished through a dedicated transport system, physically separate from the one dedicated to dirty material. Transport systems (dirty and clean material) will be directly connected to the centralised sterilisation service, if this is not placed adjacent to it. Intensive care units have an easy connection with surgical blocks, interventional radiology as well as diagnostic services. In intensive care, there are basically three separate types of access, all three of which have a filter: one for patients, one for staff and goods, and an additional access for relatives/caregivers. Intensive care units can be placed in priority relationship with the main hospital and functional areas such as, for example: surgical block, interventional radiology, diagnosis and therapy area, endoscopy service.

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- relaxation areas for relatives.

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Sheffield Children's Hospital, United Kingdom (2017)

Emergency Medicine

Emergency medicine for adults
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On the basis of the needs expressed in the requirements framework relating to the new organisational structure envisaged, it is necessary to provide up to 20 beds for emergency medicine, to be divided between single rooms and single rooms for double use, guaranteeing the possibility of conversion into sub-intensive care from a functional and plant engineering point of view.

Paediatric emergency medicine
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On the basis of the needs expressed in the requirements framework relating to the organisational structure envisaged, it is necessary to provide 10 beds for paediatric emergency medicine, to be divided between single rooms, and rooms for double use, always guaranteeing adequate space for the presence of the parent/caregiver.

2. Surgical Area

GENERAL DESCRIPTION

The Surgical Area is a highly specialised section designed to ensure close integration between its main functional components, precisely surgical block, interventional radiology, endoscopy, intensive care and the birth centre. The functional and spatial relationships between these units are designed to optimise patient, material and staff flows, ensuring operational efficiency, safety and rapid intervention.

FUNCTIONAL AND SPATIAL RELATIONSHIPS

The area must be located close to complementary functional areas, such as emergency department, intensive care, radiology and emergency diagnostics, to allow quick access and smooth management of patients from critical care areas and high technological complexity. In the proposed functional model, particular attention must be paid to defining the appropriate degree of contiguity between related functions, even if autonomous.

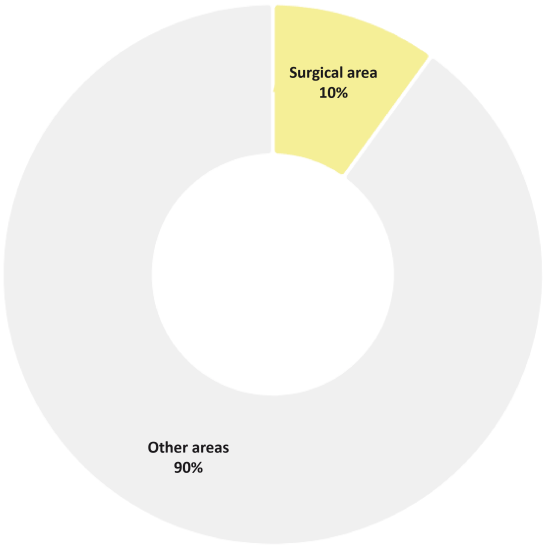
EQUIPMENT AND SIZING

Areas

Multifunctional Surgical Block (6 operating theatres)
Paediatric surgical block (4 operating theatres)
Interventional Radiology-Haemodynamics-Electrophysiology
Interventional endoscopy

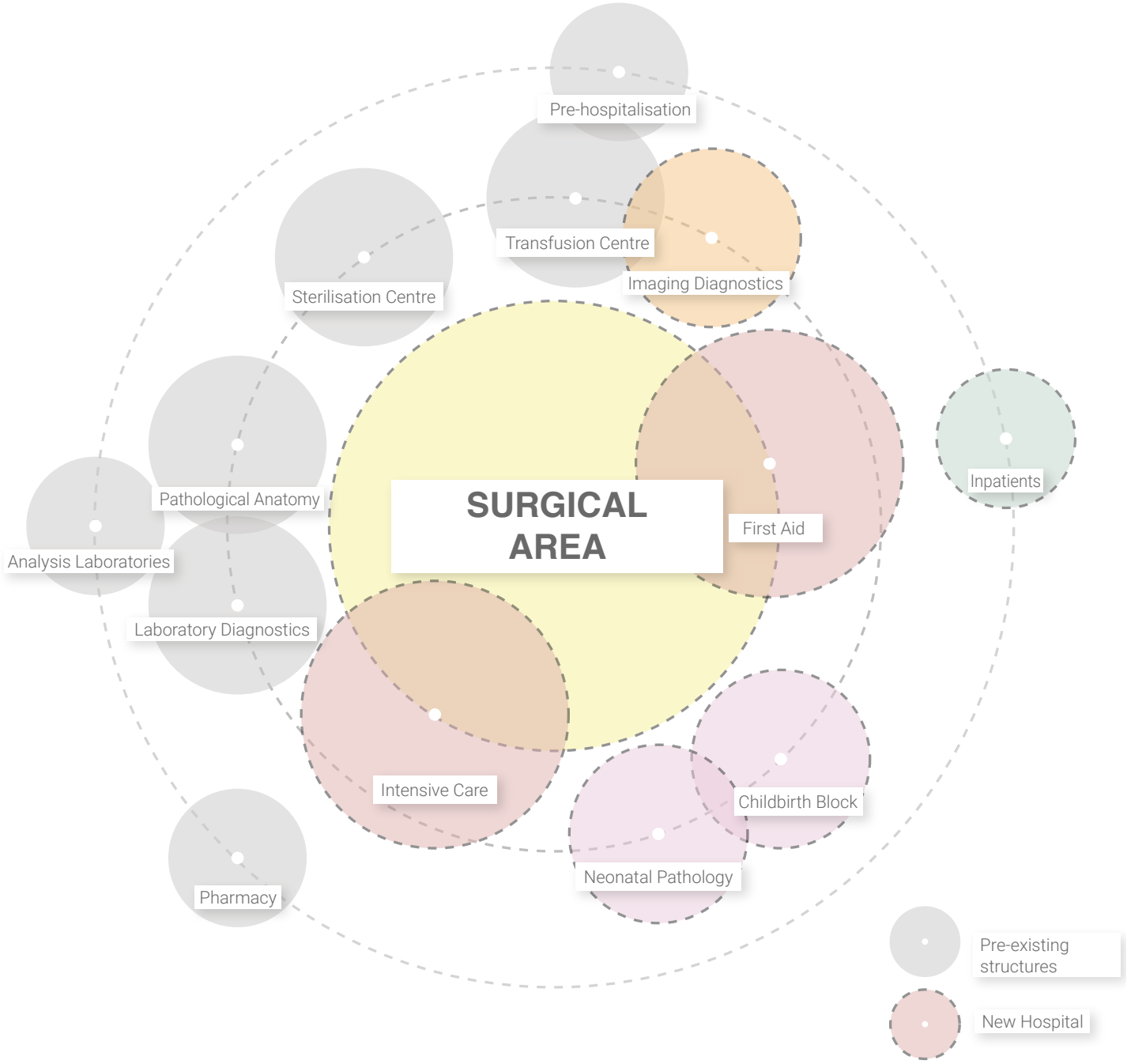
Dimensional reference

10 of the gross floor area (SLP)



Surgical Area sizing plan

SPATIAL RELATIONSHIPS



Surgical Area proximity radar

2. Surgical Area

AREA ACTIVITIES

Multifunctional Surgical Block

The multifunctional surgical block is the main function of the area, and must be configured in terms of size with a surface area equal to about 25% of the area. It is defined as an architectural-plant engineering complex with a "low microbial load", distinct and contiguous to other core hospital activities and essential for carrying out surgery.
The Surgical Block should be a priority for the following hospital and functional areas: Emergency-Urgency area, Intensive and Sub-intensive Care Area, Radiodiagnostic Support (CT/MRI), Endoscopy Service, Transfusion Centre, Forensic Pathology, Surgical Inpatient Area, Sterilisation.
On the basis of the needs expressed in the requirements framework relating to the new organisational structure envisaged, it is necessary to provide **6 operating theatres**:

- 2 emergency/elective operating theatres
- 4 hybrid emergency/elective operating theatres

The surgical block must be equipped with all the support services and ancillary equipment required for surgical procedures and the efficiency of the organisational model, such as:

- Preparation and recovery rooms
- Preparation rooms for medical staff
- Physician support areas
- Relaxation areas
- Laboratory for collection and dispatch of biological samples
- Reporting room

Paediatric Surgical Block

The paediatric surgical block is a critical section of the hospital designed to meet the specific surgical needs of paediatric patients, ranging from newborns to adolescents.
On the basis of the needs expressed in the requirements framework relating to the organisational structure envisaged, it is necessary to provide **4 paediatric operating theatres**:

- 2 emergency/elective operating theatres
- 2 hybrid emergency/elective operating theatres

The paediatric surgical block must be equipped with all the support services and ancillary equipment required for surgical procedures and the efficiency of the organisational model, such as:

- Preparation and recovery rooms
- Preparation rooms for medical staff
- Physician support areas
- Relaxation areas
- Laboratory for collection and dispatch of biological samples
- Reporting room

Lucile Packard Children's Hospital, United States (2018)

BUFFER SPACE

It is necessary to define within the Surgery macro area a buffer space that can be activated in emergency cases and in case of overcrowding, adequately prepared to accommodate even possible expansions from the most critical and complex care activities.

Interventional endoscopy

The endoscopy service will be organised by centralising the operating units with 6 multipurpose endoscopy rooms. Each endoscopic room must feature preparation rooms for surgeons and theatre staff.
Endoscopy must be interventional and compatible with Non-Operating Room Anaesthesia (N.O.R.A.).

On the basis of the needs expressed in the requirements framework relating to the organisational structure envisaged, it is necessary to provide paediatric operating theatres:

- **6 multipurpose digestive endoscopy rooms**
- **2 pulmonary endoscopy rooms**

It is also necessary to provide preparation rooms and recovery rooms. In addition to the clinical service rooms, healthcare support, resting areas, areas for administrative activities and service supports for logistics must also be provided. For endoscopic procedures that require the combined use of ionising radiation, it will be necessary to provide adequately shielded diagnostic and interventional rooms. In addition, the rooms must be equipped with diode lasers for therapeutic applications, with the related safety systems. At the plant engineering level, the division of the mechanical system must be such as to reduce the downtime to the minimum necessary (whether for maintenance work, renovations or breakdowns), in order to guarantee continuity of healthcare activities.

Interventional Radiology, Haemodynamics and Electrophysiology

Interventional radiology is a fundamental component of the surgical area, which makes it possible to define diagnostic and therapeutic procedures with a minimally invasive approach.
The service includes:

- 2 interventional radiology rooms;
- 2 haemodynamic rooms;
- 2 electrophysiology rooms.

Interventional radiology must be isolated from external interference, and must be adjacent to crucial facilities such as intensive care units, the emergency-urgency department, the sterilisation centre and day surgery (surgical area). The patient will access the facility through a filter, and will be directed to a separate and dedicated area, located before the radiology rooms, where there are two separate zones for patient preparation and recovery. As with the surgical block, interventional radiology must also ensure an effective connection with other hospital areas that require continuity or proximity, while maintaining the necessary functional independence and sterile conditions. It is essential to provide adequate medical support and service areas to ensure the correct streamlined radiology activities.

Central Peninsula Hospital, United States (2016)

3. Inpatient Area

GENERAL DESCRIPTION

The area dedicated to inpatient care is one of the most important sections within the hospital, also from a dimensional point of view. Indeed, this remains the main activity in terms of volume within the new hospital complex in light of the concentration of inpatient rooms in the new building that will be built within the hospital enclosure. The inpatient macro area of the New Hospital refers to both the activities of the Main Hospital and to those of the Children's Hospital. The organisational model of the New Hospital divides inpatient care modules by intensity of care, structured into **single and double rooms**. Single rooms should be designed to be used as double rooms to ensure a better balance between **patient well-being, privacy, containment of the risk of care-related infections** and the efficiency of the care model. Hence the need to envisage the possibility of increasing the number of beds (1+1), while still maintaining the possibility of hosting a caregiver. In addition, priority will be given to the allocation of a significant share of single rooms to ensure greater comfort and quality of care for patients. It is essential to integrate the inpatient room model with design solutions that guarantee maximum structural flexibility, both in emergency situations and in the ordinary evolution of organisational and healthcare models. This implies the possibility of quickly adapting spaces to the changing needs of both patients and the healthcare system.
The inpatient unit must ensure the highest levels of comfort starting from the environmental conditions. It must have sufficient natural lighting and adjustable artificial lighting, which allows the intensity of the light to be adjusted according to the needs of the patient and the specific therapeutic conditions. Moreover, all inpatient rooms must be accessible, in accordance with Universal Design and Design for All standards, ensuring that toilets are designed to be easily used by patients with different physical capabilities, including those with motor or sensory disabilities.

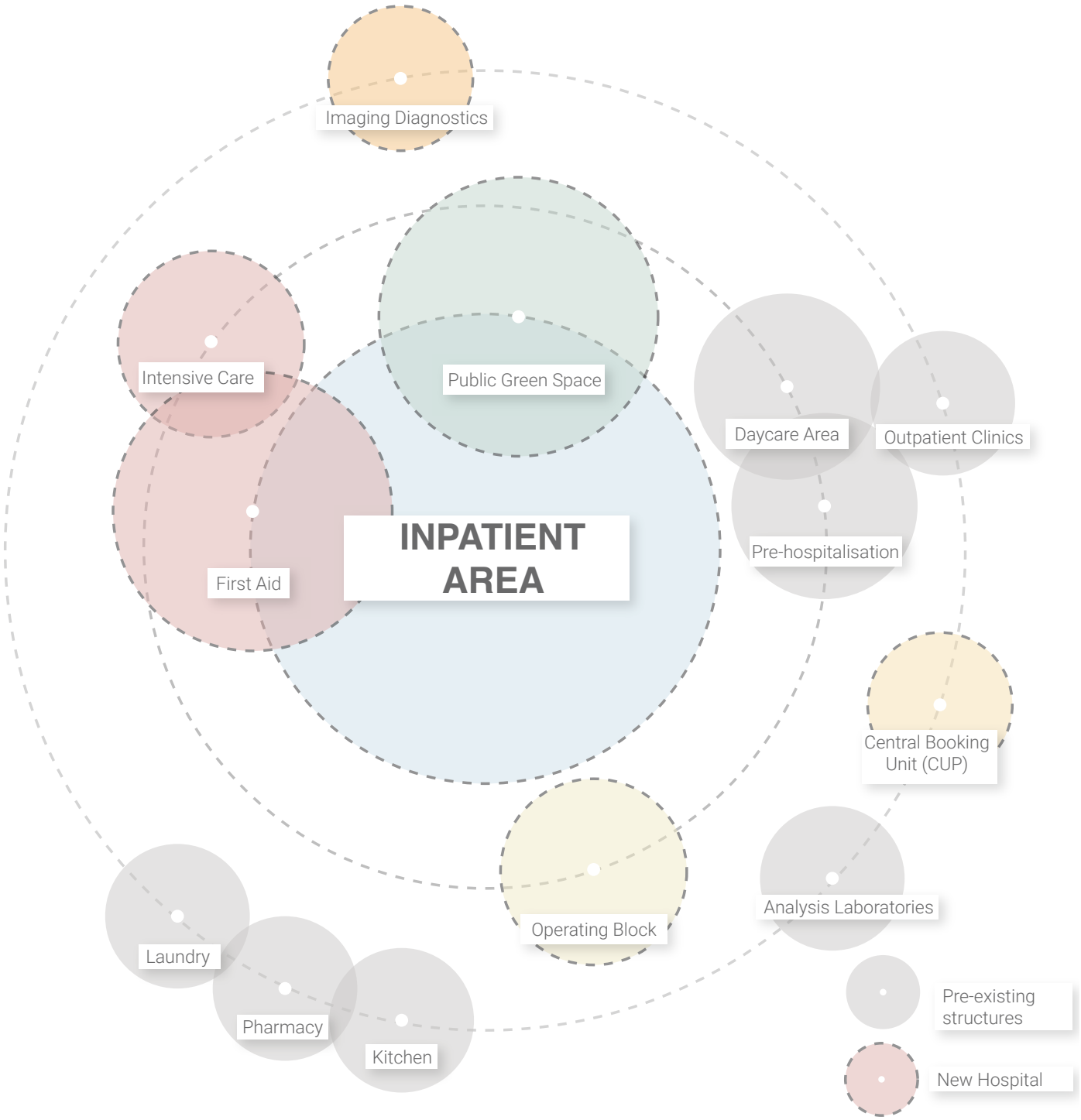
In addition to the areas dedicated exclusively to the care of paediatric patients, the New Children's Hospital will also provide for maternal-infant and obstetrics hospitalisations to meet the healthcare needs of pregnant women and mothers. These areas are functionally located within the **maternal-infant macro area**.
The inpatient area must also provide for connection with an administrative departmental area, whose functions may be redefined in Phase 2. It will be organised by modules, which will be located in the buildings of the previously existing Bordoni enclosure. Each area and type of hospitalisation must include at least the following rooms, adequately dimensioned based on the organisational characteristics of the structure, precisely an open workspace with 20 workstations, a meeting room of about 20 seats, medical offices, storerooms, toilets, technical and service rooms, locker rooms and toilets for staff.
It is also necessary to provide a **discharge room** within the inpatient macro area to support the patient discharge process. At a functional level, the discharge room must be designed as an open environment, divided into specific zones for different activities.
The latest trends suggest the possibility of locating the discharge room in a central position, and not at the service of individual departments. The level of comfort and environmental quality of the area must be enhanced to ensure patients a transition phase between the hospitalisation phase and the return to a domestic setting.

EQUIPMENT AND SIZING

Main Hospital	
Specialist surgical inpatients	130
Specialist medical admissions 1 (cardiology, pulmonology, general medicine, nephrology, hepatology and gastrology, respiratory endoscopy)	243
Medical Specialist Hospitalisations 2 (neurovascular, stroke unit, neurology)	67
Specialist infectious diseases inpatients	50
Special-paying inpatients	15
TOTAL	**505**

Children's Hospital	
Paediatric medical inpatients	30
Paediatric surgical inpatients	30
Child neuropsychiatry inpatients	20
TOTAL	**80**

SPATIAL RELATIONSHIPS



Inpatient Area Proximity Radar

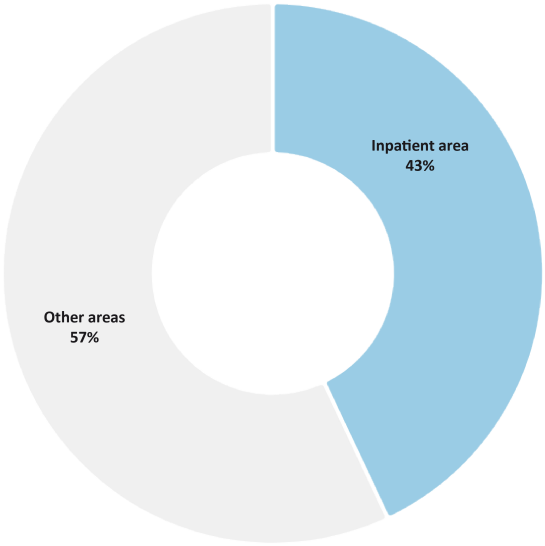
3. Inpatient Area

FUNCTIONAL RELATIONSHIPS

From a spatial point of view, the inpatient macro area must be located in a relatively reserved position compared to the more intensive operational areas, to ensure rest and recovery for patients. Inpatient wards must be organised into well defined modules, and internal pathways must be designed to separate patients, staff, and material flows. Direct access to support rooms (e.g., department pharmacies, medical material storage rooms) and general services (e.g., cleaning, waste collection) are essential for smooth and discreet operation. It is important to provide spaces for interaction with family members, such as waiting areas and interview rooms, strategically positioned to ensure privacy and comfort. It is also necessary to ensure proximity and spatial relationship with the public green areas and spaces dedicated to the function of healing garden.

At the functional level, the inpatient units can be closely linked to critical areas, such as emergency rooms, intensive care units and surgical block, to ensure the rapid transfer of patients requiring immediate care or complex interventions. At the same time, they must maintain a direct relationship with the diagnostic area and laboratory medicine to ensure the timeliness of examinations and tests required to monitor and treat hospitalised patients. It is also important to define proximity to the outpatient area to facilitate the paths of patients requiring continuous or follow-up treatment, avoiding interference with the critical patient flow. The functional and spatial relationships of the inpatient macro area are based on a balance between strategic proximity to the operational areas and an internal organisation that favours patient comfort, safety and efficiency of clinical processes.

In each department, at least 50% of the rooms must be equipped with the necessary facilities for transformation into sub-intensive workstations.



Inpatient Area sizing plan

SPECIALIST INFECTIOUS DISEASES INPATIENTS

The area dedicated to Specialised Infectious Inpatients must be guaranteed maximum functional and spatial autonomy from the entire hospital.

Waldkliniken Eisenberg, Germany (2020)

4. Diagnostic Area

GENERAL DESCRIPTION

The diagnostic area is an important part of the Hospital, as it is responsible for carrying out diagnostic and imaging examinations that are useful to assess the clinical condition of patients. This macro area is one of the most evolving and expanding hospital environments, according to technological changes in progress.
The diagnostic activity of the New Hospital is part of the diagnostic services system of the hospital, as it is closely integrated within a diagnostic system already developed and consolidated in the existing buildings. This choice meets the need to optimise resources and ensure an efficient operational flow, avoiding duplicate services and redundancy. Therefore, while the new building will house the main diagnostic services necessary to support the new functions, part of the diagnostic activities will be maintained and consolidated in the existing facilities, through the new functional programme. This integrated approach between the new and existing facilities ensures continuity of services, maximising the overall diagnostic capabilities of the entire hospital system.

FUNCTIONAL AND SPATIAL RELATIONSHIPS

The Diagnostic Area is designed to be a central and integrated hub within the hospital, with functional and spatial relationships closely connected to both inpatient and critical care departments. Its strategic location ensures direct and rapid access for inpatients, outpatients and emergency patients, reducing transfer times and optimising internal flows. The area should be functionally connected to the emergency-urgency department (single DEA), and particularly to the Emergency Department for immediate management of emergency diagnostic examinations, such as X-rays, CT scans or ultrasounds, and to the surgical block to support intraoperative or preoperative diagnostic needs. Moreover, hospital stays at the Main Hospital and Children's Hospital must have easy access to diagnostic services, ensuring continuity and timeliness in the clinical paths of inpatients.

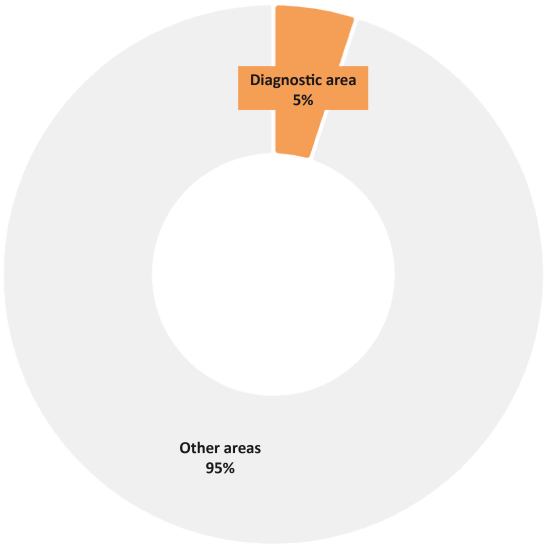
EQUIPMENT AND SIZING

Areas

Radiodiagnostics MAIN HOSPITAL
Radiodiagnostics CHILDREN'S HOSPITAL

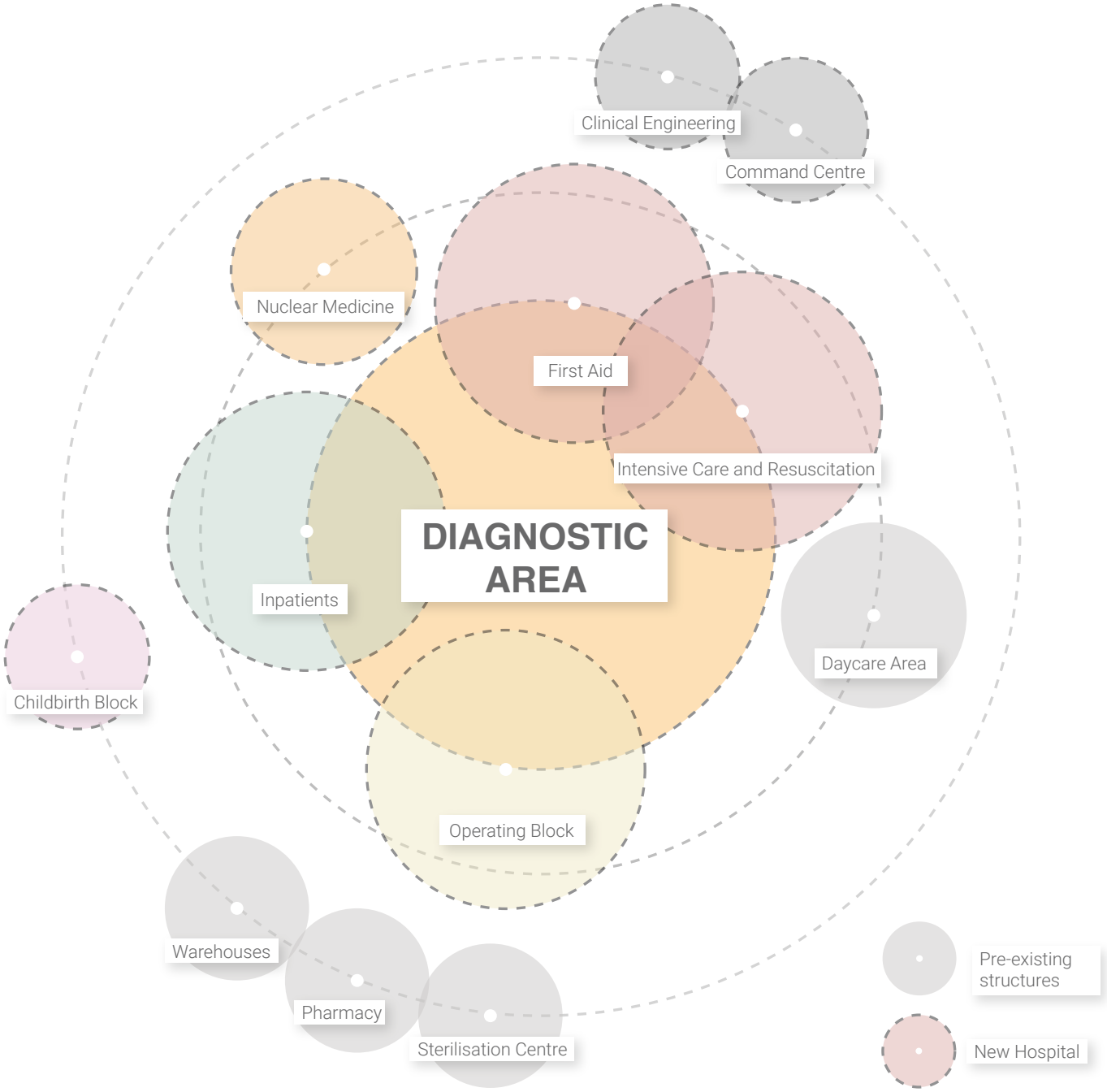
Dimensional reference

5%



Diagnostic Area sizing plan

SPATIAL RELATIONSHIPS



Diagnostic Area Proximity Radar

4. Diagnostic Area

AREA ACTIVITIES

Radiodiagnostics

The radiodiagnostics unit of the Main Hospital is designed to provide an advanced, comprehensive and highly efficient diagnostic service, with the aim of supporting the clinical functions of the hospital, and of providing rapid and accurate diagnosis for a wide variety of pathologies. The diagnostic module consists of 9 fully equipped diagnostic rooms, 2 CT scans (Computed Axial Tomography) and 3 MRIs (magnetic resonance imaging), to offer a wide range of investigations, and support physicians for patient management.

Each diagnostic room will be equipped with two passing changing rooms and toilet, as well as a dedicated control area; however it is possible to propose different aggregations, if considered more functional. Also for access to the rooms for imaging activities, filter changing rooms should be provided, differentiated for walking patients and stretcher patients.
On the basis of the needs expressed in the requirements framework relating to the envisaged organisational structure, the following equipment and necessary technical spaces must be provided (e.g., control rooms, contrast medium infusion room, medical support and service support):

- Module with 9 diagnostic rooms
- CT scan module with 2 diagnostic rooms
- MRI module with 3 diagnostic rooms

Central Peninsula Hospital, United States (2016)

Radiodiagnostics Children's Hospital

The radiodiagnostic unit within a children's hospital is defined as the functional area of the hospital dedicated to providing advanced and specific diagnostics for young patients, from newborns to adolescents. The configuration of the area takes into account the special needs of children, with functional spaces and modern imaging technologies that support precise diagnostics and minimise discomfort for young patients. Each room is designed with a focus on safety, comfort and privacy, both for children and their families. The area should be functionally connected to the new emergency-urgency department (single DEA), and particularly to the Emergency Department for immediate management of emergency diagnostic examinations, such as X-rays, CT scans or ultrasounds, and to the surgical block to support intraoperative or preoperative diagnostic needs.

On the basis of the needs expressed in the requirements framework relating to the envisaged organisational structure, the following equipment and necessary technical spaces must be provided (e.g., control rooms, contrast medium infusion room, healthcare supports and service supports):

- 2 multipurpose diagnostic rooms
- 3 ultrasound rooms
- 1 CT scan room
- 1 MRI room, 3 Tesla

The Royal Children's Hospital, Australia (2015)

Decorative wall panels for CT scan rooms

5. Maternal and Infant Area

GENERAL DESCRIPTION

The maternal-infant area is one of the main areas for the new hospital complex and for the Children's Hospital, conceived as a centre of paediatric excellence that is essential to guarantee care and treatment not only for the Brescia area, but for a wide regional area. This new area is designed to comprehensively meet the needs of maternal, child and neonatal health, addressing the growing demand for specialised care for families and children.
This macro area is essential to ensure comprehensive treatment during pregnancy, childbirth and the postpartum period, as well as to provide care for the newborn during early life.

FUNCTIONAL AND SPATIAL RELATIONSHIPS

The configuration of the Maternal-Infant macro area within the New Brescia Hospital involves integration with the other areas of the Children's Hospital and the services of the New Hospital Complex. In particular, the need is defined to develop close functional and spatial relationships with Emergency and Intensive Care activities in both paediatric and adult settings, with the Surgical and Diagnostic area for the management of surgical urgencies, and to ensure proximity to diagnostic activities for mothers and babies.
In addition, it is necessary to envisage a connection with the general services and the day area located in the existing buildings, following the reconfiguration of the hospital, and a connection to the green areas, such as the new park that will be built with the project. Indeed, the green area is a space for psychological support and recovery. It is useful for managing the psycho-physical well-being of mothers and family members during the stay in hospital.

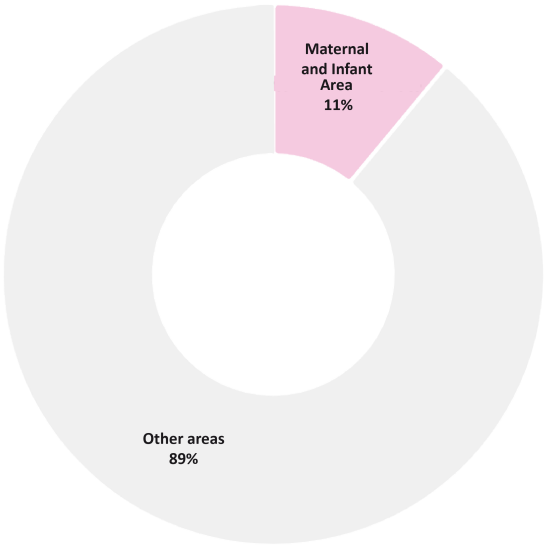
EQUIPMENT AND SIZING

Areas

Birth Centre
Neonatal Intensive Care Area
Obstetrics Inpatients 1 (Pathology of pregnancy)
Obstetrics Inpatients 2 (Post-partum period)
Creche - physiological babies

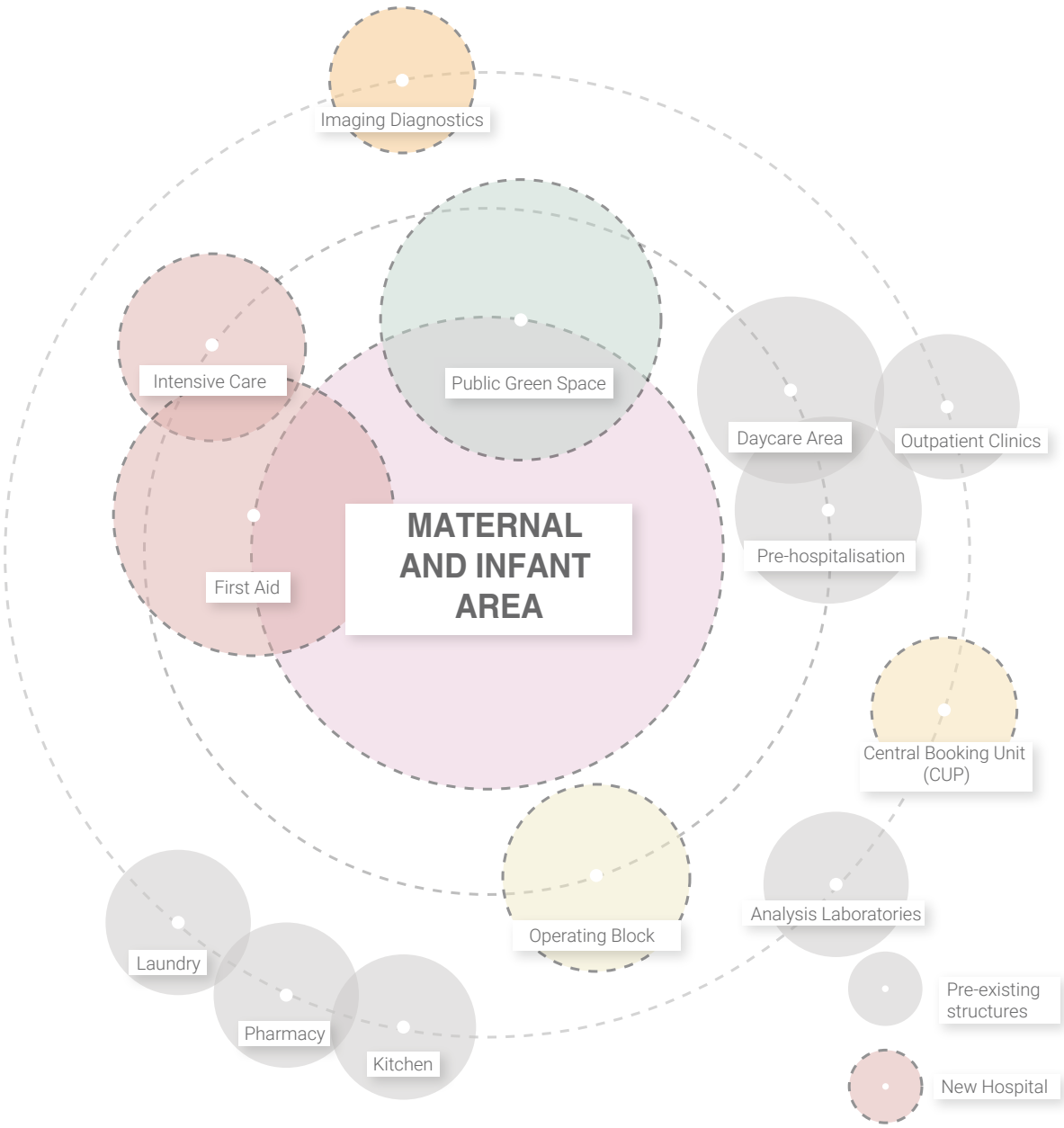
Dimensional reference

11%



Maternal-Infant Area sizing plan

SPATIAL RELATIONSHIPS



Proximity radar of the Maternal Infant Area

5. Maternal and Infant Area

AREA ACTIVITIES

Birth Centre

The birth centre is the area of the hospital dedicated to the management of the childbirth process and the stages of labour, childbirth and postpartum, with the aim of ensuring high standards of comfort and safety for mothers, infants and families.
On the basis of the needs expressed in the requirements framework relating to the organisational structure envisaged, it is necessary to provide the following facilities:

- 5 delivery rooms, one of which for special procedures
- 2 rooms for Caesarean sections

All necessary health and service support and the following areas of social and healthcare support must be integrated:

- Pre-birth activity rooms module (pre-natal monitoring room, examination room and observation room)
- Neonatal island
- Recovery area

Connections and routes
It is suggested to provide a direct and dedicated link between the emergency area, the surgical obstetrics block, the birth centre and the neonatal intensive care unit.
The Birth Centre should be a priority for the following hospital and functional areas:

- Intensive and Sub-Intensive Care Area (TIN)
- Radiodiagnostic Support (CT/MRI)
- Maternal and Infant Inpatient Area
- Sterilisation

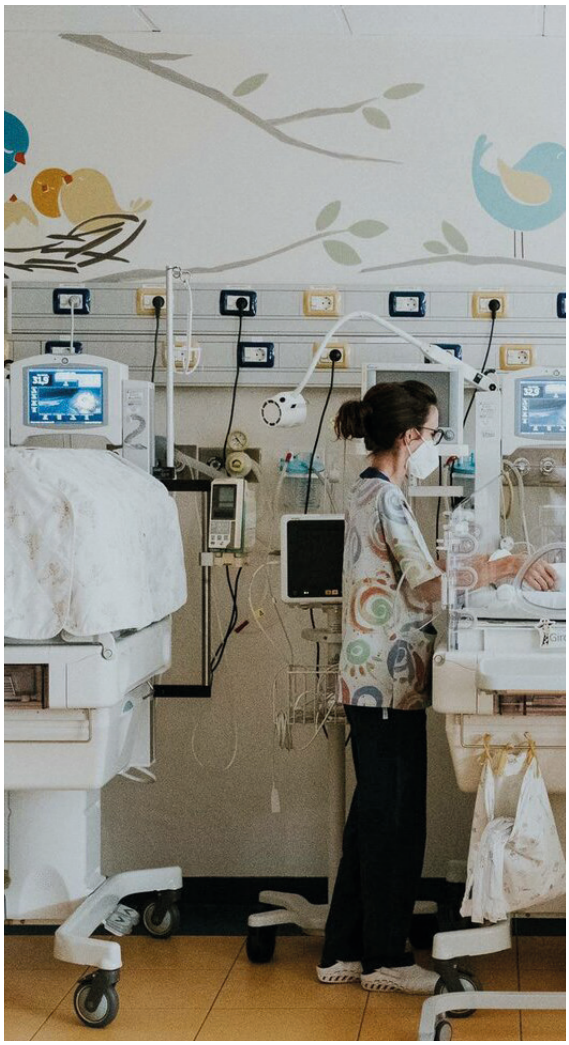
BUFFER SPACE

It is necessary to define within the Maternal-Infant macro area a buffer space that can be activated in emergency cases and in case of overcrowding, adequately prepared to accommodate even possible expansions from the most critical and complex care activities.

Creche - physiological babies

The creche area is the section of the hospital dedicated to welcoming, caring for and monitoring physiological newborns in the first days of life. The area features cots for the hospitalisation of babies who need a period of observation.
On the basis of the needs expressed in the requirements framework relating to the organisational structure envisaged, it is necessary to provide the following facilities:

- 1 Ward for physiological infants, sized for 15 cots
- 1 Ward for thermal cots, sized for 5 cots



General Hospital SS. Annunziata, Italy (2023)

Neonatal Intensive Care Area

The Neonatal Intensive Care Area is a highly specialised section of a Level II DEA hospital, intended for the care and treatment of newborns with critical conditions that require continuous monitoring and advanced life support.

The intensive neonatal area, with a **total capacity of 42 beds**, is designed to ensure specialised care and continuous monitoring for infants with various clinical needs. The division of areas allows for responses to cases of complex neonatal disease, standard neonatology and critically ill neonates requiring intensive care treatment.

The intensive neonatal area is divided into three main sections, precisely neonatal pathology, neonatology and neonatal intensive care.

On the basis of the needs expressed in the requirements framework relating to the organisational structure envisaged, it is necessary to provide the following facilities:

- Neonatal pathology area sized for **24 workstations;**
- Neonatal intensive care area (TIN), sized for **18 workstations.**

Werribee Mercy Hospital Maternity, Australia (2021)

Obstetrics Inpatients 1 and 2

The obstetrics inpatient area is a central section of the New Children's Hospital, integrating the need for obstetric care with the care of newborns and mothers, offering an integrated care pathway. The area must be designed to meet the clinical and comfort needs of women in labour and newborns, with a focus on managing complications during pregnancy and in the post-partum period. This type of specialist hospitalisation requires single rooms with large support spaces to accommodate the cot of the newborn and the reception of external visitors.

On the basis of the needs expressed in the requirements framework relating to the organisational structure envisaged, the modular division into 2 obstetrics areas is necessary:

- Obstetrics 1 with 20 beds for pregnancy pathologies.
- Obstetrics 2 with 40 beds for births, ensuring the presence of spaces for rooming-in

Connections and routes

One of the basic characteristics of this obstetrics area is its integration with other hospital sections of both the Children's Hospital and the Main Hospital. This is essential to manage any complication that may arise during childbirth or in the post-partum period. The main connections are as follows:

- Neonatal Intensive Care Area (TIN): for the treatment of newborns requiring intensive care, such as premature infants or those with serious complications.
- Surgery Block: in case a Cesarean section or urgent surgery are required for the mother.
- Emergency Department: to accommodate emergency births, which need immediate assistance.
- Laboratories and Diagnostics: to perform urgent examinations such as ultrasounds, blood tests and other diagnostic tests required during labour and the post-partum period.

Design Requirements

This chapter defines the technical, spatial and functional requirements at the basis of the hospital project, laying the foundations for planning that not only meets, but exceeds, the minimum requirements of quality and functionality, responding to current and future health challenges. This integrated approach aims to combine technological and architectural innovation with a deep awareness of the existing urban context, ensuring harmony between the new facility and the existing infrastructural fabric.

Location-related requirements play a role of primary importance. The project must be conceived as a connection between the urban transport system and existing structures, facilitating access and ensuring efficient connections. This integration is also reflected in the management of flows, routes and accesses, which must be designed to optimise the circulation of patients, healthcare staff and visitors, minimising travel times and ensuring intuitive usability of spaces.

The volumetric development, another key aspect of the project, is intertwined with the idea of flexibility, which translates into the possibility of expanding or reconfiguring the environments in response to any changes in the way healthcare services are provided. Particular attention is also paid to the adoption of the principles of universal design. The hospital must be designed to be accessible and usable by every user, without architectural or functional barriers, promoting an inclusive environment that respects the different needs of mobility and accessibility.

Environmental sustainability is another cornerstone of the project. The construction of a building that respects criteria of energy efficiency, responsible use of resources, and minimal environmental impact is planned. This commitment also extends to the creation of a "healing environment", a context designed to promote the well-being of patients by using materials, colours, lighting and green spaces that can contribute to a therapeutic dimension of architecture.

An essential element for the effectiveness of the facility is the wayfinding system, designed to guide each user intuitively and immediately through hospital environments. This system, integrated with the most modern digital technologies, will make it possible to implement innovative solutions for the management and communication of internal pathways, significantly improving the hospital user experience. Finally, digitisation plays an essential role in optimising operational management. The integration of advanced IT systems capable of coordinating all the functions of the facility in real time makes it possible to create a dynamic ecosystem that is responsive to the needs of a constantly evolving healthcare environment.

The themes that encompass design requirements are:

- **Location and relationships with existing buildings**
- **Volumetric development**
- **Flows, Paths and Access Points**
- **User Centre and Universal Design**
- **Environmental sustainability**
- **Flexibility**
- **Healing Environments**
- **Wayfinding**
- **Digitisation**

> Location and relationships with existing structures

Maasstad Hospital, Rotterdam, The Netherlands (2011)

The intervention area

The functional orientation of the New Brescia Hospital is a crucial step in the planning decision-making process, with profound implications for environmental, social and economic sustainability, as well as for the efficiency of social and healthcare services. An adequate strategic location can facilitate relationships and connections with existing buildings, urban regeneration processes, and improve accessibility to healthcare services, helping to create a resilient and inclusive healthcare ecosystem, taking into account a broad overview of the entire healthcare supply chain.

The location of a hospital directly affects the urban context, becoming a landmark for both the community and the local healthcare system. The location of a hospital facility must take into account several factors, including:

- the reception of a wide variety of users;
- the large dimensions of the building;
- its impact on the economic supply chain.

The location of the new hospital complex within the Spedali Civili di Brescia enclosure underscores the importance of the location features to be enhanced.

Relationship with the urban transport network

The location of the new Brescia hospital, connected to the main roads and public transport (with particular reference to the road transport network and the subway stop in the immediate vicinity of the facility), will have to guarantee easy access for both patients and medical staff, while minimising the environmental impact.

Accessibility

Adequate accessibility is a prerequisite for the success of a healthcare facility. A modern hospital must promote sustainable mobility strategies, including modal interchange hubs, pedestrian and cycle paths, as well as flexible and adaptable parking.
Integrating shared mobility hubs, such as secure bicycle parking and electric vehicle charging areas, will both improve accessibility and promote healthy and sustainable lifestyles for the whole community, obtaining the most demanded quality and sustainability certifications.

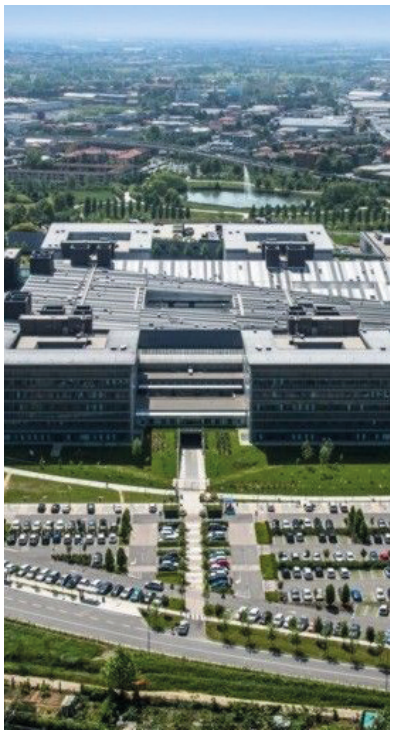
St. Olav's Hospital, Nordic, Norway (2013)

Insertion of architectural landscape and enhancement of existing buildings

Another essential aspect is the insertion of the hospital in the landscape, which must be designed in continuity with the natural and urban context. Vegetation is not only an aesthetic element, but an essential factor for the psychological and physical well-being of patients and staff. Recent studies have shown that the presence of green spaces and therapeutic gardens can significantly improve patient recovery and reduce staff stress.

Over the decades, the evolution of the hospital has seen expansion and transformation interventions which, in some cases, have respected the dialogue with the existing historical and architectural context, while in others they have introduced volumes in stark discontinuity with the original layout. It will be equally important to consider the relationship with the existing buildings, seeking a balance between innovation and historical continuity, so that the intervention can be harmoniously integrated into the built fabric without impairing the historical identity of the Bordoni building.

> Volumetric development



LHA (ASST) Papa Giovanni XXIII Hospital, Bergamo, Italy (2000)

Horizontal Development

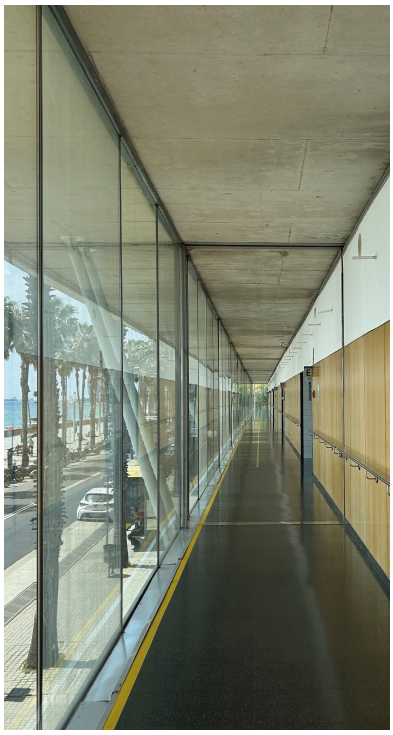
The new hospital will be designed following a horizontal and compact volumetric model. The design of hospital facilities with a mainly horizontal development facilitates the management of flows, reducing the dependence on vertical connections and improving overall efficiency.
This approach facilitates healthcare organisation, allowing the creation of autonomous functional core units that can operate independently both in ordinary conditions and in emergency situations, increasing the system's resilience. The horizontal configuration offers numerous operational and logistic advantages. By reducing the distances travelled, it optimises the distribution of functions and internal pathways, improving operational efficiency and user experience. The division into macro areas, with a clear distinction between health and technological-logistic functions, ensures more effective management of flows, reducing travel times and improving the organisation of daily operations.
In addition to improving operational efficiency, this configuration helps create a more welcoming and less intimidating hospital environment for patients. Studies show that healthcare buildings with a low height promote better orientation and improve the overall patient experience. Moreover, the horizontal architecture facilitates integration of both landscape and context, promoting a harmonious transition between the hospital and the existing surroundings.

Autonomous Functional Core Units

A central element of the proposed model is the possibility of structuring autonomous functional core units. These modular core units allow flexible management of clinical and logistic activities, increasing the hospital's ability to quickly adapt to different operational needs.
In the event of emergencies, pandemics or peak demand, each core unit can ensure operational continuity independently, while offering the ability to tailor care to the specific needs of patients. Attention to volume and configuration of spaces is, therefore, an essential pillar in the design of the new hospital.
These principles not only ensure a highly functional and efficient hospital environment, but also contribute to creating a resilient and sustainable facility, capable of facing future challenges and ensuring a positive experience for patients, staff and visitors. This approach also makes it possible to theorise dedicated and specific functional connections between different core units and buildings.

SJD Pediatric Cancer Center,
Spain (2022)

> Flows, Paths and Access Points



Hospital del Mar, Barcelona, Spain (1992)

Flow Separation

Management of flows, routes and access is an essential element in hospital design. Separation of flows helps to improve operational efficiency and ensure the safety of patients, staff and visitors.
Proper planning of accesses and internal routes reduces interference between different types of users, ensuring operational continuity even in emergency situations. Differentiation of flows is an essential requirement. Separate access points should be provided for patients, staff and goods, minimising the possibility of overlap.

Planning flows for emergency conditions

Entrances for ordinary and emergency patients must be located diagonally opposite or far apart, ensuring independent driveways for emergency vehicles and ordinary users.
Critical care areas, such as the emergency department, require dedicated routes that allow quick access to urgent treatment areas, avoiding interference with less serious patients.
The separation between public and technical-healthcare flows is essential to ensure safety and efficiency.

Spatial Optimisation

The public paths, represented by the main street, act as the main axis for the movement of patients and visitors within the facility.
Instead, the technical-healthcare path, with a minimum width of 3 metres (extending to 4 metres in critical care areas such as the emergency department and intensive care), is intended to transport stretcher patients, equipment and medical materials.
This system ensures physical separation between healthcare activities and public flows, reducing the risk of contamination and increasing operational efficiency.
The internal corridors of the medical areas, with a minimum width of 2.5 metres, must include niches to facilitate the rotation of stretchers and wheelchairs, while allowing the use of spaces for ancillary or support functions.

Logistic paths

Dedicated lifts for transporting medical materials and waste must be ensured, strategically located to avoid interference with patient and visitor routes.

New York-Presbyterian David H. Koch Center, New York, USA (2018)

Automated systems such as pneumatic mail, light transport and self-driving vehicles (AGVs) can further improve efficiency, ensuring rapid delivery times and reducing congestion on main routes.
Innovative strategies will have to be studied to connect the new hospital complex with the existing buildings in the hospital area.

Main Street

It is necessary to ensure a main axis, defined as Main Street, connecting the different healthcare functions of the Main Hospital and Children's Hospital, also featuring a relaxation purpose for social and healthcare staff.

Maasstad Hospital, Rotterdam, The Netherlands (2011)

Waste Flow

Waste flow, particularly infectious waste, must follow separate and dedicated pathways to minimise the risk of contamination.
The strategic location of temporary storage areas along technical routes improves the efficiency of logistics, minimising unnecessary transport.

Strategic Vertical Links

Separate lifts must be provided for patients, staff and goods. They must be deployed strategically to ensure speed and safety in vertical movements. In critical care areas, in particular, it is essential to ensure direct and dedicated connections, with short and unobstructed routes, between the emergency department, the intensive care unit and the surgical block. This layout allows for timely management of emergencies and rapid access to the resources required for intensive care.

Copenhagen University Hospital, Copenhagen, Denmark (2015)

> User Centre and Universal Design

Inclusive freight elevator that supports different needs of physical-motor, sensory and cognitive impediment

Universal accessibility

Hospital design must meet the physical, psychological and social needs of users, adopting an integrated approach that combines Universal Design and Inclusive Design. These principles create accessible, usable and functional spaces for all user categories, regardless of age, gender, or motor, cognitive and sensory abilities.

A central element is the differentiation of spaces according to the specific needs of different types of users. The design must include areas with dedicated functions, such as separate entrances for outpatients, staff and visitors, ensuring distinct flows to minimise interference between different user categories. For example, it is essential to separate the routes of stretchered patients from those of walking users and visitors, to ensure safety, efficiency and respect for privacy.

Furthermore, the adoption of Universal Design principles ensures that all environments are accessible and usable by users with different capacities. This includes the use of ramps, adequate lifts, spaces without architectural barriers, and visual, tactile and acoustic signage systems to facilitate orientation within the facility. The design must ensure that users with sensory or cognitive disabilities can navigate spaces autonomously, with the help of pictograms, colours and intuitive signage, increasing the effectiveness of spatial communication.

Customisation of places

The differentiation of spaces also extends to recreational and communal areas. Although designed with common characteristics, these areas must be adaptable to meet the specific needs of different user categories. For example, waiting rooms can be configured to ensure both privacy and socialising, offering different seating options and flexible layouts. The customisation of spaces improves the overall user experience, respecting their individual preferences and promoting psychological comfort.

Finally, the User-Centered Design approach implies the direct involvement of users in the design process. The participation of patients, caregivers and healthcare professionals allows us to develop design solutions that respond more effectively to their needs. This involvement improves the functional features of spaces, and contributes to a sense of belonging and control, essential elements for the well-being of users within the hospital.

Center for Cancer and Health, Copenhagen, Denmark (2011)

San Joan de Dèu Hospital, Barcelona, Spain (2022)

Single rooms

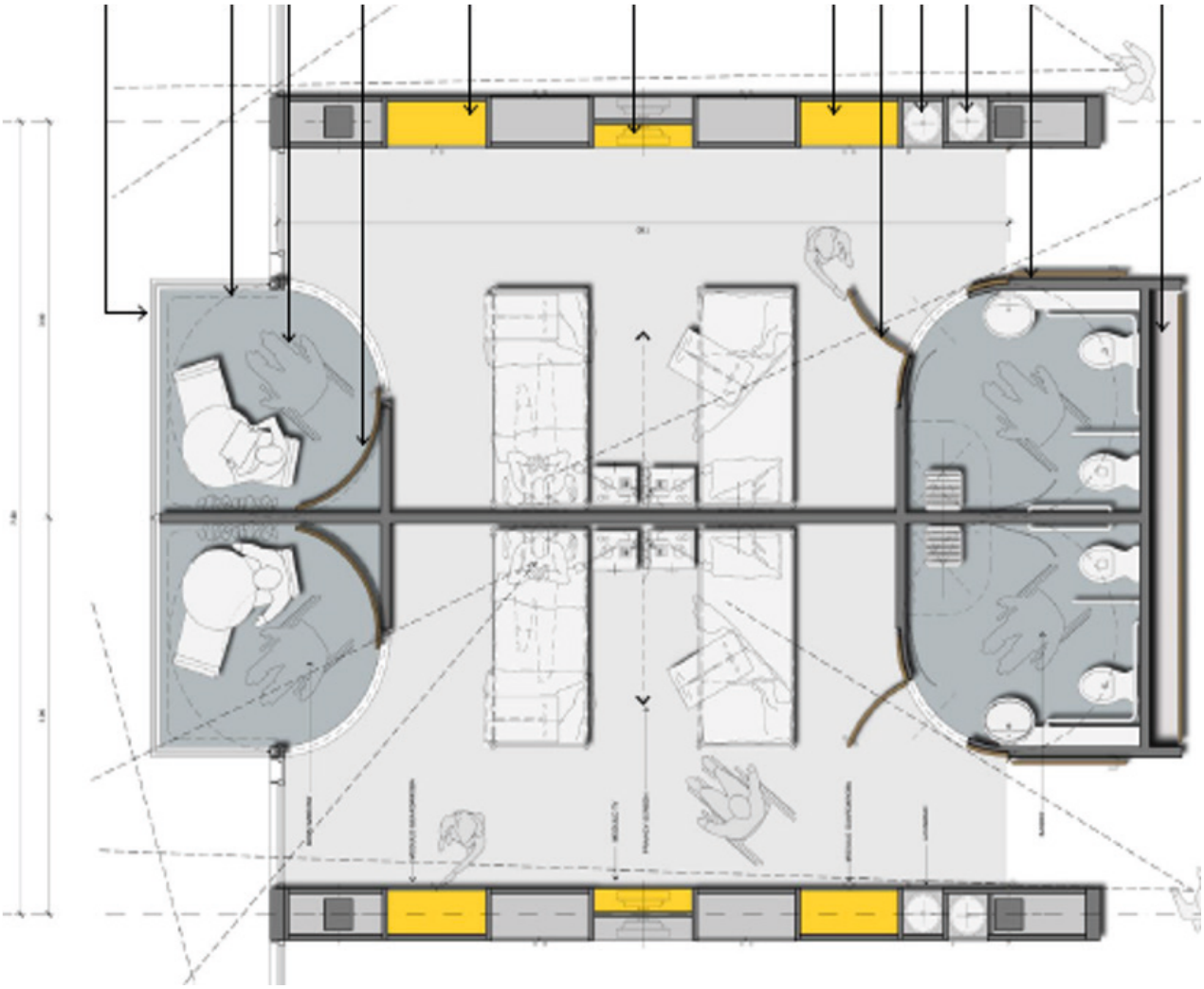
The adoption of single rooms meets multiple needs, including infection control, respect for privacy, and the creation of a comfortable and personalised environment for each patient. Recent best practices and evidence-based studies show that most inpatient rooms should be single rooms with a design that promotes patient safety, privacy and comfort.
These rooms must be sized as a double room, thus ensuring the possibility of accommodating a second bed for a parent or caregiver. This flexibility is particularly useful in case of an emergency or to support paediatric and long-term patients. In addition, where possible, the integration of family housing units is recommended to support patients in terminal palliative care, providing adequate space to ensure the constant presence of family members during the most critical phases of the treatment path.

The adoption of single rooms meets multiple needs, including the control of nosocomial infections. In a hospital setting, where the risk of infection is particularly high, single rooms provide a physical barrier between patients, limiting the spread of pathogens and improving health safety. In addition, these chambers allow isolation measures to be adopted for patients with contagious diseases without compromising the operations of other units.

Concerning comfort and customisation, single rooms offer a quieter and more private environment, which promotes the physical and mental recovery of the patient. This type of configuration allows patients to have more control over their environment, including the ability to regulate lighting, temperature and access to technological resources, such as entertainment systems and telemedicine platforms. This configuration also fosters more effective and confidential communication between the patient and the healthcare team, improving the quality of care and patient satisfaction.

The organisation of internal spaces in single rooms is essential to maximise their functionality. It is essential to ensure a rational distribution of medical furniture and equipment, while ensuring a welcoming and well-lit environment. Windows, in addition to providing natural light, offer a visual connection with the outside, which has been shown to have positive effects on the psychological well-being of the patient.

A further advantage of single rooms is flexibility. In emergency situations or when there is an increased demand, these rooms can be adapted to accommodate additional equipment or converted into intensive isolation units. This ability to adapt makes the hospital more resilient and better prepared to respond to future healthcare crises. Finally, it



Città della Salute, Milan, Italy (2015)

is crucial that single rooms are part of a wider integrated management system, including advanced technologies for remote monitoring and clinical data management. The implementation of digital systems, such as interactive panels for communication with healthcare workers, improves the quality of care and enables more efficient management of hospital resources.

> Environmental sustainability

Meyer Children's Hospital, Florence, Italy (2007)

Energy efficiency

Sustainability is a key element in the contemporary design of healthcare facilities, with particular focus on solutions that guarantee energy efficiency, responsible management of resources, and low environmental impact throughout the life cycle of buildings. The new hospital intends to stand out as a model of sustainability, aligning itself with the objectives of the 2030 Agenda and European regulations on decarbonisation and environmental management. The design aims to create a resilient structure, which not only meets the healthcare needs of the community, but also becomes a point of reference for environmental and social sustainability.

One of the most important approaches is the integration of passive and bioclimatic systems for the management of energy resources. The use of natural light is maximised through bioclimatic halls and photovoltaic façades, which not only filter light to reduce energy consumption, but also produce renewable energy directly on site. This approach is essential to achieve operational carbon emission reduction targets, one of the cornerstones of the World Health Organisation guidelines for sustainable hospitals. Green roofs and ventilated roofs, in addition to improving thermal insulation, contribute to reducing the heat island effect and promote a healthier microclimate, improving occupant comfort and helping to reduce summer energy consumption. The efficiency of the building shell is further optimised through the use of high performance façades, combined with active shading systems for the most critical exposures, ensuring maximum thermal and visual comfort. These interventions meet the most stringent regulatory requirements and also national and international recommendations, which emphasise the need to integrate energy-saving technologies in all design and operational phases.

The intervention is part of a plan that envisages a review phase of the general energy strategy of the hospital complex through an energy efficiency contract (EPC) being defined. Late in December 2024, the LHA (ASST) Spedali Civili published an exploratory notice of expression of interest aimed at finding economic operators interested in presenting proposals for public-private partnerships, for the management, in whole or in part, of energy services (heating, cooling, steam, domestic hot water) at the Spedali Civili di Brescia Hospital, as well as the construction, management and maintenance of the respective systems. The deadline for submitting proposals is the end of June 2025.

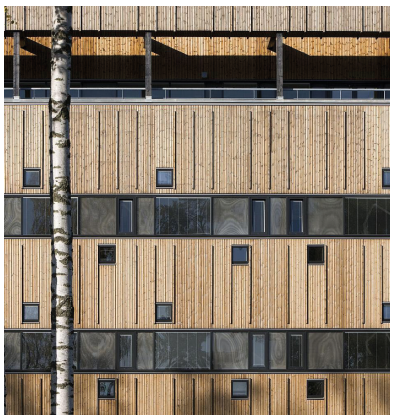
Paediatric Hospice L'Arca sull'albero (The Ark on the Tree), Bologna, Italy (2023)

Sustainable mobility

Regarding sustainable mobility, the project may involve the implementation of modal interchange hubs, strategically positioned to encourage the use of public transport, electric vehicles and cycling. These hubs include charging stations for electric vehicles, protected bicycle parking lots and micro-mobility spaces, promoting universal accessibility and reducing emissions associated with travel both inside and outside the hospital enclosure. Connection with urban cycle paths and local networks is a fundamental aspect to ensure sustainable integration with the local context.

Innovative Plant Engineering Solutions

Concerning plant engineering, the hospital will be able to adopt cutting-edge solutions in line with the energy management scenario,



Akershus University Hospital, Nordbyhagen, Norway (2008)

and to meet at least 60% of energy needs through renewable sources, as envisaged by the most recent European regulations. The adoption of energy recovery systems from expelled air and variable flow systems further contributes to the reduction of energy consumption, optimising the use of resources based on the actual occupation of spaces. Rainwater recovery and reuse is also a focal point of the plant engineering strategy, in line with the objectives of sustainable management of water resources established by international guidelines. Plant engineering and management aspects must also be effectively considered in relation to existing buildings, systems and networks of sub-services to optimise interference and dialogue with the thermal context.

Sustainable materials

The design of the hospital according to Circular Economy principles involves the adoption of regenerative and recycled materials, supported by the introduction of a materials passport, which traces the origin, use and future recycling of the building elements. This strategy not only reduces the waste generated, but encourages the use of resources with a low environmental impact. The hospital is, therefore, a resilient and innovative infrastructure, capable of adapting to the climate and social challenges of the future, in line with global best practices of sustainability and environmental management.

New green areas

Through the creation of Healing Gardens and multifunctional green spaces in the new park in the intervention area, the project contributes not only to the conservation of local biodiversity, but also to the psychophysical well-being of users with particular reference to integration with the urban context. These interventions are in line with the recommendations of the World Health Organization, which emphasise the importance of vegetation to improve mental health and patient recovery.

Integration with the architectural context

The landscape project of the hospital plays a crucial role in strengthening ecological continuity and environmental regeneration. It will be appropriate to ensure adequate provision of free areas and green spaces to support development in the medium-long term, as well as creating connections with the green network and the municipal and supra-municipal ecological network, ensuring high standards of environmental, urban and architectural quality.

Rush Hospital, Chicago, USA (2015)

> Flexibility

Fiona Stanley Hospital, Perth, Australia (2014)

Variable surface flexibility

Flexibility is an essential pillar in contemporary hospital design, allowing healthcare facilities to quickly adapt to changing clinical, technological and operational needs, ensuring continuity of services in both ordinary settings and in emergency situations. This principle, which is essential for long-term sustainability, is articulated on different design levels, starting from processes and reaching individual functional units. As for the new hospital complex, this translates into the provision of building areas for future expansion, the reuse of parts of the complex, and the integration of networked information systems to optimise operations and facilitate the outsourcing of support services.

Constant surface flexibility

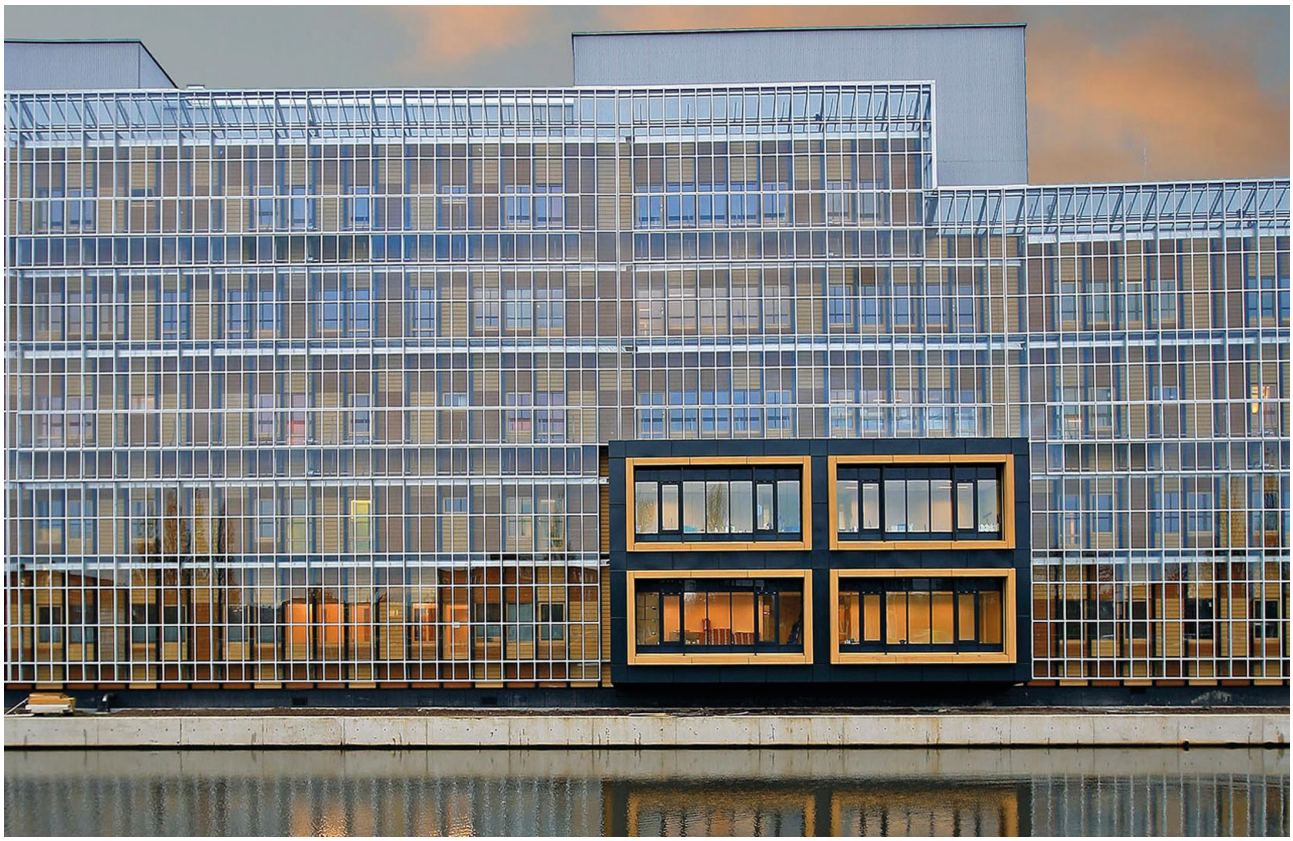
At the building level, the presence of rustic spaces, modular façades and replaceable plant engineering systems ensures continuous growth and adaptation without invasive structural interventions, while in the individual functional units the use of movable walls and modular systems allows for a rapid reconfiguration of the spaces, adapting them to varying needs such as the transition from operating theatres to intensive care units.
Individual rooms must also be designed to offer multifunctionality, with mobile furnishings and technological systems that can be adapted to meet specific clinical and organisational needs.

Head room

In “low-medium care” areas and general services, it is essential to ensure a minimum head room of 4 metres, while in critical care areas and areas with high technological complexity, the minimum height must be 5 metres.

Resilient and Flexible Design for Healthcare Emergencies

The experience of the COVID-19 pandemic has highlighted the need to integrate operational resilience criteria into hospital design. A significant example is Rambam Hospital in Haifa, which converted an underground car park into a 2,000-bed hospital. In the context of the Brescia Hospital of the future project, the design of the underground car park must envisage its reconfiguration, even partially, into healthcare areas dedicated to emergencies. This requirement must be taken into account in the choice of finishes, systems and infrastructures, guaranteeing rapid conversion times.



Martini Hospital, Groningen, The Netherlands (2007)

Structural Grid

It is also advisable to adopt a regular structural grid of approximately no less than 8x8 meters, to enhance spatial flexibility and regularity. However, such structural sizing is only an optimal indication, and is not a minimum or mandatory requirement. From a structural point of view, flexibility takes the form of the adoption of solutions such as floating floors and movable partitions that facilitate access to electricity, water and communication networks, allowing for rapid and non-invasive modifications. Multipurpose spaces, such as waiting rooms that can be converted into training rooms or telemedicine rooms, enhance efficiency and use of resources.

Flexible plant engineering system

Regarding technology, scalable infrastructures and modular plant engineering systems ensure the integration of new medical technologies and the continuous improvement of energy performance. MEP (Mechanical, Electrical and Plumbing) systems must also be

Rambam Health Care Campus, Haifa, Israel (2014)

designed to ensure high flexibility and future adaptability, just like the construction system. The plants are optimised to maximise energy efficiency with technical arrangements that allow subsequent implementations and customisable configurations. The entire plant engineering network is designed to allow remote or automated monitoring and management of microclimate parameters, thanks to adequate sensors and advanced digital control systems. These systems are integrated with the digital twin of the New Hospital, offering an advanced technological and digital infrastructure for personalised control and operational optimisation.

Buffer Space

Buffer spaces and rustic areas, strategically located near critical departments such as the emergency department, are key resources for responding to peak activity or hosting additional functions in a short time. These spaces, equipped with plant engineering systems, can be quickly converted into interventional areas, intensive care units or diagnostic wards, ensuring operational continuity during emergencies. The modularity of the construction represents a further element of flexibility. The adoption of prefabricated systems allows entire functional blocks to be added or removed quickly, adapting them to emerging needs without impairing the quality of services. A significant example is the Martini Hospital in the Netherlands, which uses easily reconfigurable 60x16 metre modules to accommodate new functions without interrupting existing operations.

Hospital de Emergencias Enfermera Isabel Zendal, Madrid, Spain (2020)

> Healing Environments

377 Kinderspital Zürich, Zurich, Switzerland (2024)

Healing gardens

One of the key aspects of the healing environment is the integration of natural elements inside and outside the building. Therapeutic gardens, often classified according to their location and type of users, are an effective solution to promote psychophysical well-being. For example, gardens dedicated to cancer or paediatric patients are designed to meet specific needs, including safe pathways, meditation areas and spaces for light physical activity.
The integration of these gardens helps to improve patient satisfaction and well-being, and allows staff to reduce stress and recover energy during breaks at work. Views of the vegetation, guaranteed by the hospital rooms in the most advanced projects, have been correlated with a reduction in anxiety and an acceleration of the healing process.
In urban hospitals, where space is limited, solutions such as winter gardens or bioclimate greenhouses provide an effective alternative to maintaining contact with nature.

Welfare areas

The welfare area plays a crucial role in supporting healthcare workers, a category often subjected to high levels of stress. The presence of relaxation spaces, such as rooms with ergonomic seating, quiet areas and recreation areas, can significantly improve job satisfaction and productivity.
Some international hospitals have introduced recharge rooms, environments featuring natural elements and designed to encourage the physical and mental regeneration of staff after particularly demanding shifts.
These spaces, in addition to being customisable according to individual needs, demonstrate how an approach centred on staff well-being can translate into an overall improvement in healthcare services.

Spaces for patients, family members and caregivers

At the same time, it is essential to consider the needs of patients and their family members or caregivers.
Warm meeting spaces, complete with reading corners, co-working spaces and Wi-Fi, create a more inclusive and familiar atmosphere. For example, the new hospital projects include spaces dedicated not only to socialising, but also to refreshment and physical activity.
These environments, which are also accessible to the public, are an innovative model of the hospital as a hub for well-being, where therapeutic activities are intertwined with social and community activities of prevention and health promotion.

Sayanomoto Clinic, Saga, Japan (2014)

Home-like atmosphere

Contemporary hospital design is increasingly moving towards models that place the psychophysical and social well-being of users at the centre. These approaches aim to create environments that not only facilitate physical healing, but significantly improve the overall experience of patients, healthcare workers and caregivers. Recent studies have shown that careful design of spaces can positively influence recovery times, reduce stress levels, and improve the quality of life for both those who receive care and those who provide it.

The home-like atmosphere aims to reduce the perceptual distance between the hospital environment and the domestic setting, promoting a sense of familiarity and comfort. This approach translates into a flexible design of inpatient areas, with adequate spaces to accommodate caregivers or family members, and the use of materials and furnishings that combine aesthetics and functionality. The use of dynamic lighting systems, for example, makes it possible to maintain a natural day-night circadian rhythm, improving patient rest and supporting psychological well-being. In addition, the presence of common kitchens, dining rooms and relaxation areas promotes socialising and interpersonal interaction, which are essential for psychophysical recovery. In some cases, the home-like approach also extends to spaces dedicated to intergenerational interaction, such as playrooms and play areas for children, or to specific services for staff, such as gyms and co-working spaces. These elements, in addition to promoting a balance between work and private life, contribute to creating a more humane and welcoming hospital environment.

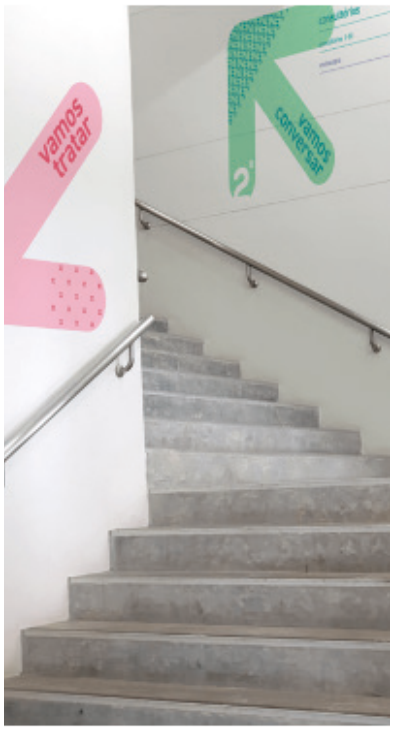
Rabot Community Health Centre, Idealstraat Ghent, Belgium (2021)

Evidence-based design

The integration of design strategies described in this chapter is based on scientific evidence that shows how a well-being-conscious built environment can significantly improve clinical outcomes, reduce the length of hospitalisation, and increase the satisfaction of all user categories. Hospital design oriented towards well-being is not limited to meeting functional needs. It is proposed as an innovative model for creating places of care that are also living and social spaces. These principles, applied in different contexts, offer a holistic view of healthcare architecture, where personal care is at the centre of every design choice. The involvement of users in the design is essential to ensure that the facility responds effectively to their needs. Collecting feedback through simulations, pilot tests or Post Occupancy Evaluation helps to identify any critical issues and make improvements based on empirical evidence. This approach, within the field of Evidence-Based Design, ensures that the solutions adopted are supported by concrete data, increasing the effectiveness and efficiency of the project with respect to specific needs.

SJD Pediatric Cancer Center, Barcelona, Spain (2022)

> Wayfinding



377 Kinderspital Zürich, Zurich, Switzerland (2024)

Universal accessibility

A well-designed wayfinding system not only orients visitors but becomes a strategic element to improve operational efficiency and user experience. In a modern hospital, where the speed and clarity of movement can directly influence the quality of care, an effective guidance system becomes essential to reduce stress and improve service perception.
Wayfinding starts from the outside, with a clear identification of the main entrances, parking areas and public transport connections. The aim is to ensure easy and seamless access, integrating the building into the architectural context of the hospital sector and the wider surrounding urban context. Visual consistency between inside and outside reinforces the identity of the place, making orientation more intuitive for all users, from the moment they access the perimeter of the hospital.

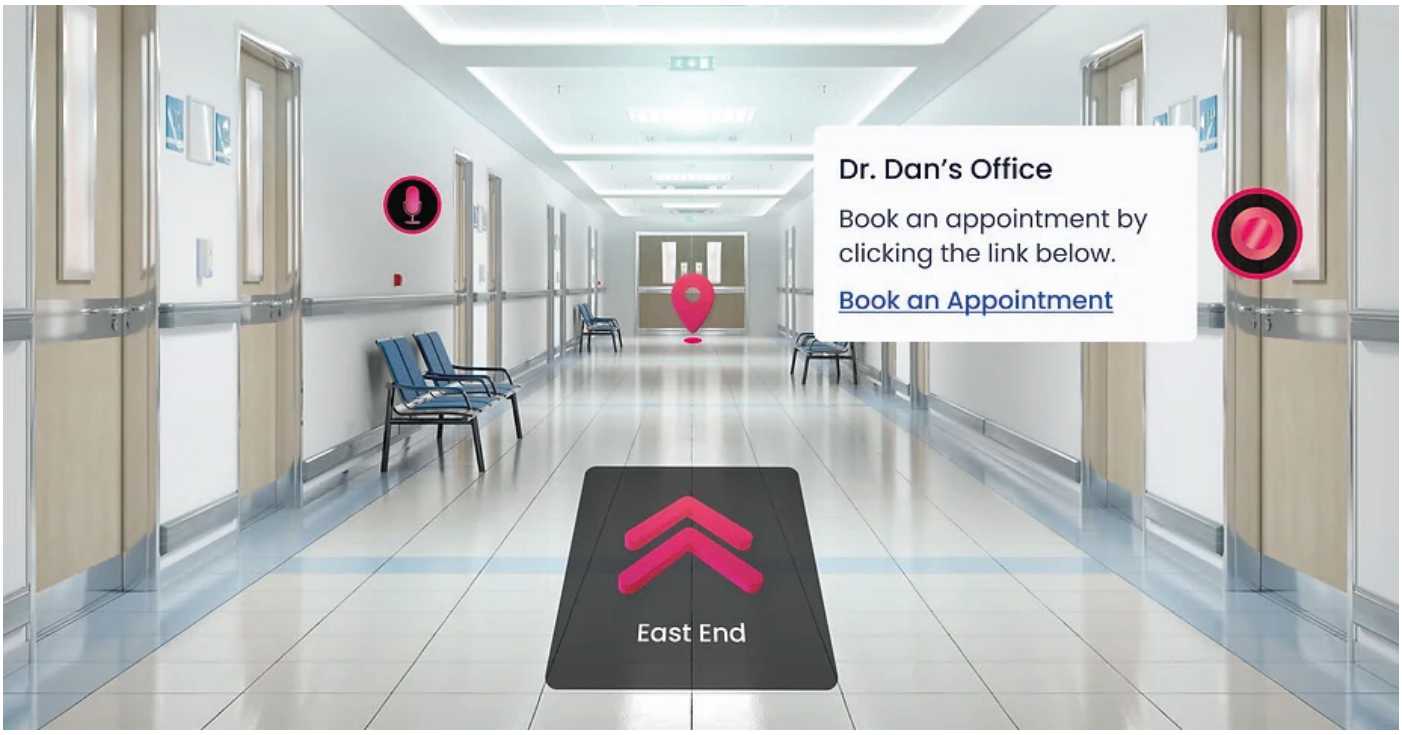
Inside, the orientation system combines visual, audible and tactile signage, designed to be universally accessible, regardless of the users' cognitive, linguistic or physical abilities. Interactive digital tools, such as information totems and mobile apps, provide personalised directions and updates in real time, improving accessibility and enabling a personalised experience. This approach allows, for example, to provide shorter routes for patients with reduced mobility or specific directions to critical wards.

Integrated wayfinding system

Technology plays a key role in optimising wayfinding. The use of RFID tags and beacons allows for monitoring and optimising internal flows, improving resource management and ensuring that patients and staff quickly reach their intended destinations. These digital tools integrate with modular signage systems, which can be easily updated to respond to changes in the configuration of spaces or hospital operations.

Architectural Orientation

Architecture itself can act as a natural guide. Elements such as corridors with exterior views, well-lit spaces and intersections designed with visible focal points help users find their way around without the need for written directions.
Lighting, both natural and artificial, is another crucial tool for facilitating orientation, creating a visually clear and welcoming environment.



Augmented Reality Wayfinding for Hospitals

> Digitisation

Pneumatic mail system

Digital innovation

The new hospital should be an advanced example of technological integration, digitisation and smart systems, aimed at ensuring operational efficiency, safety and long-term sustainability. The adoption of cutting-edge technological solutions improves the patient experience, optimises clinical and management processes, and promotes the resilience of the entire healthcare infrastructure. Telemedicine is another technological pillar of the new hospital. Through digital platforms, patients will be able to access medical advice remotely, reducing the need for travel and improving access to care. The hospital will be able to integrate electronic information systems for the unified management of clinical data, improving communication between departments, and ensuring fast and secure access to information. These systems will reduce the use of paper, and improve traceability and data security.
Concerning safety, advanced technologies such as facial recognition and motion sensors can be implemented to monitor the environment in real time, ensuring a high level of protection for patients and staff. Environmental comfort will also be optimised through intelligent lighting and air conditioning systems, which will automatically adapt the environmental conditions according to the presence of people and the specific needs of each department. These systems not only improve the patient experience, but also contribute to the hospital's overall energy efficiency.

Smart Building Technologies

Key technologies include the Building Energy Management System (BEMS), which allows real-time monitoring and regulation of energy and water consumption, reducing waste and optimising resources. This system integrates with a digital twin platform, which virtually replicates the hospital to simulate operational scenarios, improve predictive maintenance, and support strategic decisions.
Another crucial element is the introduction of the Digital Twin, a digital model that simulates the behaviour and performance of the entire building. This tool allows not only to monitor operations in real time, but also to predict and solve any problems before they arise. The Digital Twin offers simulation scenarios to test innovative solutions, improving the resilience and adaptability of the hospital to future needs. This technology, applied in healthcare contexts, also supports predictive maintenance, minimising the downtime of critical systems. Digitisation extends to internal handling and logistics systems, both related to the new hub and to redefining and optimising the hospital sector. The adoption of AGV (Automated Guided Vehicles) platforms guarantees automated and efficient transport of materials along dedicated routes, improving safety and reducing the workload of personnel. In addition, a pneumatic mail system will connect key areas such as laboratories,

Mercy Virtual Care Center, Chesterfield, USA (2015)

pharmacy, surgical block and emergency department, speeding up the transfer of sensitive materials such as biological samples and drugs. For external transport, the hospital will include a drone station, which will enable the rapid and safe transfer of blood and blood components.

Intelligent Medical Devices

An innovative aspect is the use of intelligent medical devices and remote monitoring systems, which will allow constant monitoring of patients' vital signs, both in hospital and at home. This approach personalises care, improves emergency management, and optimises the use of healthcare resources. Finally, the hospital's IT infrastructure must be integrated to ensure interoperability, scalability and cybersecurity, protecting sensitive data and supporting technological evolution over time. This infrastructure will enable a rapid response to future healthcare challenges and continuous updating of technologies, keeping the hospital at the forefront of the healthcare sector. The adoption of these advanced technological solutions positions the new hospital as a benchmark not only for the quality of care, but also for the ability to integrate digital innovations in a sustainable and highly efficient context.


4

DESIGN LEVELS AND GRAPHIC DRAWINGS

The chapter summarises the project levels identified in accordance with current legislation. In addition, the contents and formats of the minimum graphic, technical and design documents required by the call for tenders are detailed and specified.

Design Levels and Graphic Drawings

The sequence of project levels to be developed to upgrade the Spedali Civili di Brescia hospital complex pursuant to Article 41 of Decree Law 36/2023 is introduced by the definition of the Technical and Economic Feasibility Project pursuant to Section II, articles 6 to 19 of Annex 1.7.

In particular, this public works design phase shall ensure:
a) that community needs are met;
b) compliance with environmental, urban planning and cultural and landscape heritage protection standards, as well as compliance with the provisions of legislation on the protection of the health and safety of buildings;
c) compliance with architectural and technical-functional quality requirements, as well as compliance with the expected time and costs;
d) compliance with all existing constraints, with particular regard to hydrogeological, seismic, archaeological and forestry constraints;
e) energy efficiency and minimisation of the use of non-renewable material resources throughout the project-related works;
f) respect for the principles of economic, territorial, environmental and social sustainability of the intervention, also to counteract soil consumption, encouraging the recovery, reuse and enhancement of existing building stock and urban fabrics;
g) rationalisation of design activities and related verifications through the progressive use of digital information management methods and tools for construction referred to in article 43;
h) accessibility and adaptability in accordance with current provisions on architectural barriers;
i) the geological and geomorphological compatibility of the work.

Subsequently, the Executive Project will be developed in accordance with section III, articles 22 to 31 of Annex 1.7 of the same Legislative Decree.The development of the Technical and Economic Feasibility Project (PFTE) will be structured in two different phases, linked to the timing of the tender procedure:
- Competition phase
- Finalisation of the PFTE (with an intermediate step for the approval of distribution layouts, as per the contract outline attached to the documentation of this competition).

For details of the timescales and operating methods, see the call.

Competition phase

In the competition phase, the Contracting Authority asks the subjects admitted to the project submission phase to develop and describe the project idea in the following works:
- explanatory and technical report for a maximum of 3,500 characters per page, including spaces, in UNI A4 format on a maximum 20 MB PDF file, oriented vertically, for a total of 20 (twenty) pages that illustrates the guiding criteria, also through diagrams and images, of the design choices in relation to the objectives set out in the Call and the characteristics of the intervention;
- report on the insertion of the new building(s) in the hospital context, respecting continuity of care for a maximum of 3,500 characters per page, including spaces, in UNI A4 format on maximum 20 MB PDF files, oriented vertically, for a total of 10 (ten) pages illustrating the guidelines, track trends and development strategies of the Masterplan, also through diagrams and images, of the design choices in relation to functional constraints and guaranteeing continuity of care;

Graphic drawings: 8 (eight) tables in UNI A0 format on maximum 60 MB PDF files, vertically oriented, illustrating the project concept and containing at least the following elements:

- masterplan with physical and functional insertion of new buildings, and forecast of future development as per the indications of the Project Design Document (DIP);
- plan for inserting the intervention on a scale of no less than 1:2000, accompanied by profiles (schematic sections), to assess the functional relationships of the new hospital and the connections with the existing hospital in the various possible construction phases;
- layout of the project area including the hospital building and connections, at a scale of not less than 1:1000, with a definition of the road network (access flows and indoor-outdoor-emergency-logistics routes);
- 3D representations of insertion of the work from a territorial, urban and landscape point of view;
- plans of all representative levels of the hospital building(s), elevations and representative sections on a scale of no less than 1:500, highlighting the functional distribution and flow pattern (e.g., external, internal, goods);
- any other illustrative technical work deemed

suitable to describe the morphological, typological, structural and technological aspects required to understand the architectural solutions adopted.

Summary calculation of expenditure and economic project framework contained in a dossier of up to 6 (six) pages in UNI A4 format on a PDF file. The specific conditions are explained in the call.

PFTE specialising programmes

The winner of the competition will be entrusted with the task of integrating the competition documents in order to reach the level of in-depth study of a Technical and Economic Feasibility Project which, drawn up and developed with BIM technology, must contain a timeline relating to the entire implementation process of the work.

The winner of the competition, in the development and completion phase of the PFTE, undertakes to:

- take into account any recommendations, comments and indications made by the panel of judges at the end of the competition;
- take into account any requests for specifications, distributional-functional layout changes, which do not alter the overall nature of the assignment, made by LHA (ASST) Spedali Civile di Brescia;
- take into account possible proposals for specifications, improvements, which do not alter the overall nature of the assignment, by the Contracting Authority;
- support the Contracting Authority in technical meetings with the entities responsible for issuing authorisations, as well as in preparing drafts for the presentation of the project to the aforementioned entities in the event of a preliminary service conference;
- bear the costs and expenses of reproducing the requested works for the purpose of completing the PFTE.

The Contracting Authority reserves the right to request submission of an intermediate delivery of the project documents during which to define the progress of the PFTE completion activities, and to acquire the prior approval on distribution layouts by LHA (ASST) Spedali Civili di Brescia.
In order to ensure a constant comparison with the Contracting Authority during the activities to complete the technical and economic feasibility project, the winner undertakes to participate in all the meetings convened by the Sole Project Manager (RUP) during the completion phase of the project itself, and to carry out all surveys and cognitive studies (e.g., morphology, geology, geotechnical, hydrology, hydraulics, seismic, ecosystem units, historical evolution, land use, landscape, architectural, historical-cultural values, preventive archaeology, regulatory constraints, etc.).
The PFTE takes into account, as far as possible, the orographic and morphological characteristics of the physical context of intervention, limiting changes in the natural course of the land (and consequently soil consumption and earth movements), while also safeguarding the hydraulic unofficial nature of waterways (natural and artificial) affected by the work, the hydrogeology of the subsoil, and the geotechnical stability of the surrounding natural reliefs and artificial reliefs.
The PFTE will also have to illustrate the construction phases, defining the connections to guarantee healthcare continuity and proximity of specific functional areas, with a view to reorganising, rationalising and enhancing existing buildings. Timescales for demolitions, testing and intermediate and final transfers must also be established.

When drafting the PFTE, particular attention should be paid to:

a) ecological compatibility of the design proposal, favouring the use of techniques and materials, elements and components with low environmental impact;
b) adoption of measures that, in harmony with the project proposal, promote the protection and enhancement of cultural heritage, contributing to preserving the memory of the national community and its territory, and promoting cultural heritage as a driver of economic development;
c) adoption of bioclimatic design principles and “passive systems” that allow to improve the energy balance of the building, with a view to an overall sustainability of the intervention itself;
d) useful reuse of excavation materials (as by-products and/or for naturalistic engineering interventions), minimising landfilling;
e) assessment of overall life cycle costs, including end-of-life costs;

f) inspectability and maintainability of the work, including using the methods and tools of digital information management of constructions referred to in article 43 of the Law;
g) adoption of the best guidelines for the processes and methods of transport and storage of goods, capital goods and personnel, functional to the start-up, construction and maintenance phases of the work, favouring certified models, processes and organisations.
h) road compatibility, through the implementation of a project for employee access to underground parking.

Unless otherwise stated by the Sole Project Manager (RUP) in the Project Design Document (DIP), in relation to the size, type and category of the intervention, the PFTE generally comprises the following works:

a) general report;
b) technical report, accompanied by surveys, investigations and specialist studies;
c) report of prior verification of archaeological interest (article 28, paragraph 4, of the Law on Cultural Heritage and Landscape referred to in Legislative Decree no. 42 of 22 January 2004, and any direct field surveys, including digitally supported ones;
d) environmental impact study for works subject to Environmental Impact Assessment, hereinafter referred to as «VIA»;
e) sustainability report of the project;
f) plano-altimetric surveys and state of consistency of existing works and those interfering in the immediate surroundings of the work to be designed;
g) information templates and related specialist report, in the cases provided for in article 43 of the Law;
h) graphic drawings of the works, in the appropriate scales, integrated and consistent with the contents of the information models, when present;
i) estimation of the work;
l) economic project framework;
m) an economic and financial plan in principle for works to be carried out by public-private partnership;
n) time schedule;
o) safety and coordination plan, aimed at protecting the health and safety of workers on construction sites, pursuant to Legislative Decree no. 81 of 9 April 2008, as well as in application of existing trade union agreements on the subject. Estimation of security costs. The security and coordination plan may be supported by information models;
p) specifications in the cases provided for in article 43 of the Law. The information specifications will contain the specifications relating to the equivalence of the information content present in the documents with respect to the levels of information requirements required for the information models;
q) preliminary maintenance plan for the work and its parts. The maintenance plan can be supported by information templates;
r) preliminary geotechnical and structural monitoring plan;
s) for works subject to the Environmental Impact Assessment (VIA), and in any case where required, preliminary environmental monitoring plan;
t) particle plan of expropriated areas or areas to be acquired, where relevant.

The completion of the PFTE must contain all the documents and floor plans necessary to obtain opinions, permits and authorisation to carry out the work.

Drawing up the Executive Project

The Contracting Authority reserves the right to decide whether to start the next design phase relating to the winning project proposal. The conditions for awarding the contract are described in the Call.
This is without prejudice to the right of the Contracting Authority to invoke the provisions of art. 41 of Italian Legislative Decree 36/2023, or not to proceed with the award of subsequent design levels to that of technical and economic feasibility.
The intellectual property of the project belongs, in any case, to the winner of the Competition.
The executive project, drawn up in conformity with the previous level of technical-economic feasibility planning, determines in detail the works to be carried out, the respective estimated cost with an indication of financial coverage and the timeline consistent with that of the technical-economic feasibility project. The executive project must be developed at a level of definition such that each element is identified in terms of form, type, quality, size and price. The project must also be accompanied by a dedicated maintenance plan

for the work and its parts, in relation to the life cycle of the work itself.
The executive project is drawn up in full compliance with the requirements dictated in the qualifications or when assessing urban conformity, or at a conference of services or environmental compatibility, where envisaged.
The executive project contains the final definition of all the processes and, therefore, describes the intervention to be implemented in full and in every architectural, structural and plant engineering detail. Only site operating plans, supply plans, calculations and graphs relating to provisional works are excluded.

Unless otherwise determined by the contracting authority, the executive project, in relation to the size, type and category of intervention, consists of the following documents:

(a) general report;
b) specialist reports;
c) graphic drawings, including those relating to structures and plant engineering systems, as well as, where applicable, drawings relating to environmental mitigation, environmental compensation, environmental restoration and improvement;
d) calculations of the executive design of the structures and systems;
e) maintenance plan for the work and its parts;
f) update of the security and coordination plan indicated in article 100 of Legislative Decree no 81 of 9 April 2008;
g) framework of incidence of labour;
h) time schedule;
i) list of unit prices and any analyses;
l) estimated metric calculation and economic framework;
m) draft contract and special tender specifications;
n) updated particle expropriation plan;
o) technical report and implementation of the minimum environmental criteria (CAM) of reference, referred to in the Law, where applicable;
p) dossier adapted to the characteristics of the work, containing the contents indicated in Annex XVI to Legislative Decree no. 81 of 9 April 2008;
q) environmental site management manual.

In accordance with article 43 of the Law, in line with the information containers and information models configured and prepared in the technical-economic feasibility project within the data sharing environment, as far as possible, the graphic drawings must be extracted from the aforementioned information models. The nature of the geometric-dimensional and alpha-numeric information requirements necessary for the executive project is defined in the information requirements determined in the CI, in relation to the content requirements envisaged in the DIP. The specification of information levels, together with the definition of the expected purposes of the information models and any conformity control rules, must be used to verify the executive project for validation purposes, and can be used in the management of the related authorisation paths.

5

CONSTRAINTS AND REQUIREMENTS

The chapter details all caregiving constraints and requirements useful for defining the parameters within which the project proposal can be developed.

Constraints and Requirements

Description of the intervention

The area covered by the intervention is 50,380 sq.m, within which the total demolition of the Infectious Diseases Building and the Satellite Building is planned, for a total of approximately 85,000 sq.m of Gross Floor Area (SLP).
Since the area of intervention is located within the Hospital enclosure, and the buildings subject to total demolition house highly complex healthcare functions (such as the Emergency Department of Stairwell 6), the correct and continuous operation of all hospital areas must be guaranteed during all construction phases. Hence, the intervention is divided into three steps, described below.
For further details on the demolitions to be carried out in Phase 1, subject to the DIP, see the DOCFAP.

Step 1

The first step involves the certified area on the north-east perimeter of the Bordoni walls, adjacent to the entrance to the underground car parks outside the Hospital, for a total area of 26,880 sq.m. During this step, Stairwell 7 of the Satellite Building (8,795 sq.m of SLP) and the entire Infectious Diseases Building (18,085 sq.m of SLP) will be demolished, for a total volume of over 95,300 cubic metres. In this step, no intervention is made on the building hosting the emergency department to guarantee its full operation. The aim of this phase is to free up part of the project area, so as to be able to start construction works on the new buildings and consequently allow the transfer of the highly complex functions before the buildings that currently house them are demolished, thus guaranteeing continuity of Hospital services and healthcare activities.

Step 2

In this step, the remaining demolitions take place in the area of the Satellite Building, on a total area of 23,500 sq.m, involving the Satellite Building and any demolition of the indoor connection between Stairwell 10 of the Satellite Building and the kitchen/canteen block (indicated in the general plan of the Hospital with code 05), for a total of 50,995 sq.m of demolished SLP and a volume of about 189,000 cubic metres. During this step, there are three different activities, listed in chronological order of implementation:

- construction of the new building within the area previously freed in step 1 by the demolition of the Infectious Diseases Building;
- relocation of existing hospital activities to the new building. The volume built in this step must host at least the following activities: Children's Hospital and Single DEA (Main and Children's Hospital);
- Demolition of the Satellite building and part of its connection to Monoblock D.

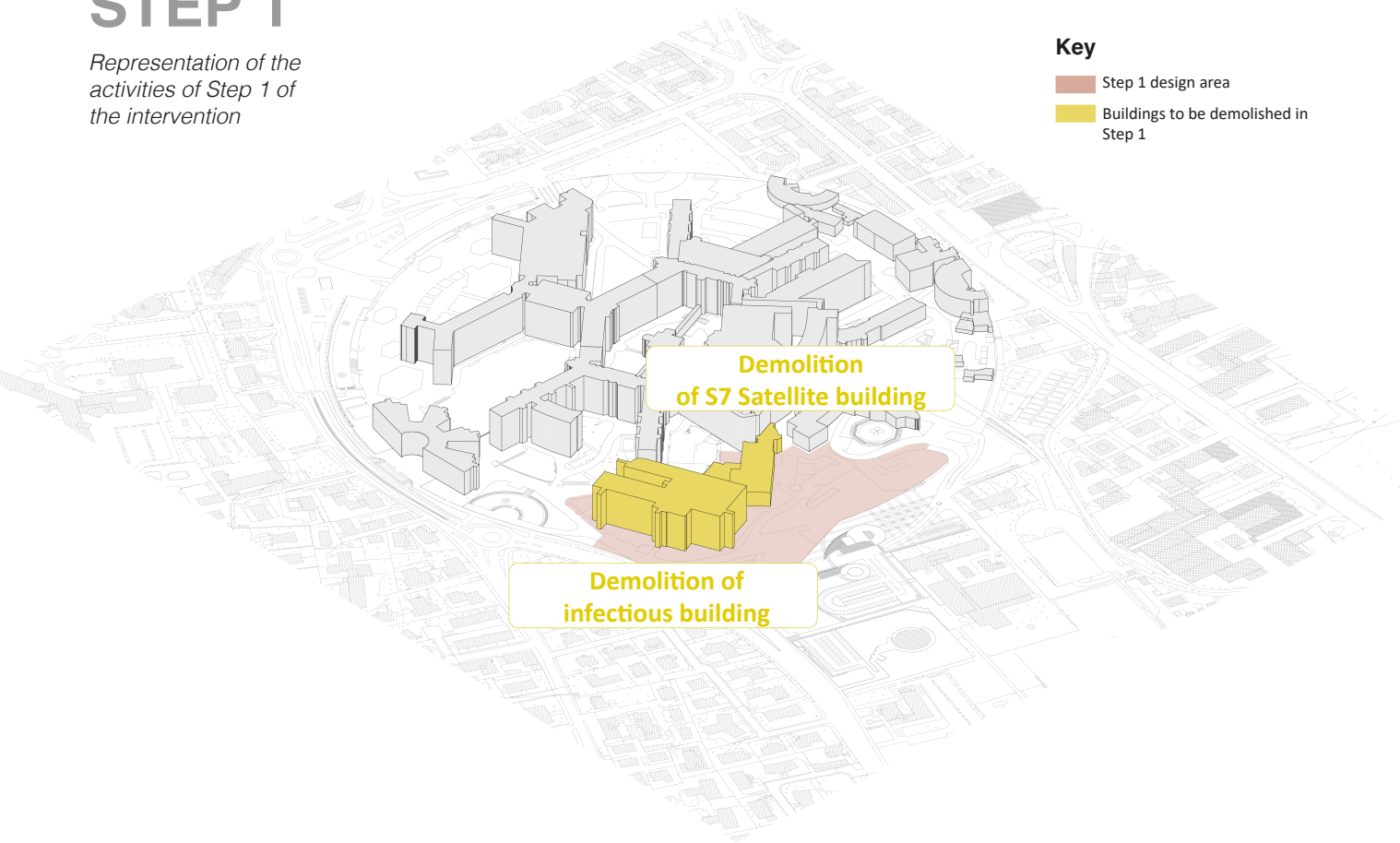
If the project proposal of the successful bidder involves the area currently occupied by the helipad, the hospital guarantees the possibility of identifying a new area for its placement in respect of the financial constraints of the intervention. From this perspective, it is necessary to ensure continuity of access to the current Emergency Department until it is moved to the new building (STEP 2). At the end of the third activity of step 2, the remaining part of the project area is cleared, having ensured continuity in the provision of the health activities of the Hospital in all phases of the construction site. The following diagrams represent the various activities of this Step. Please note that the shape and position of the volume of the new building shown in the diagram below are not intended as design requirements, and that the arrows indicating the movements of activities are intended for purely illustrative purposes and, therefore, do not represent the actual transfers of functions.

Step 3

The last step, in light of the presence of the completely free project area, involves the construction of the possible further residual volume, the insertion of the functions not yet located in the building built in Step 2, and the completion of the external areas. It must be said that the form and number of volumes are not prescriptive, but are represented by way of example only.

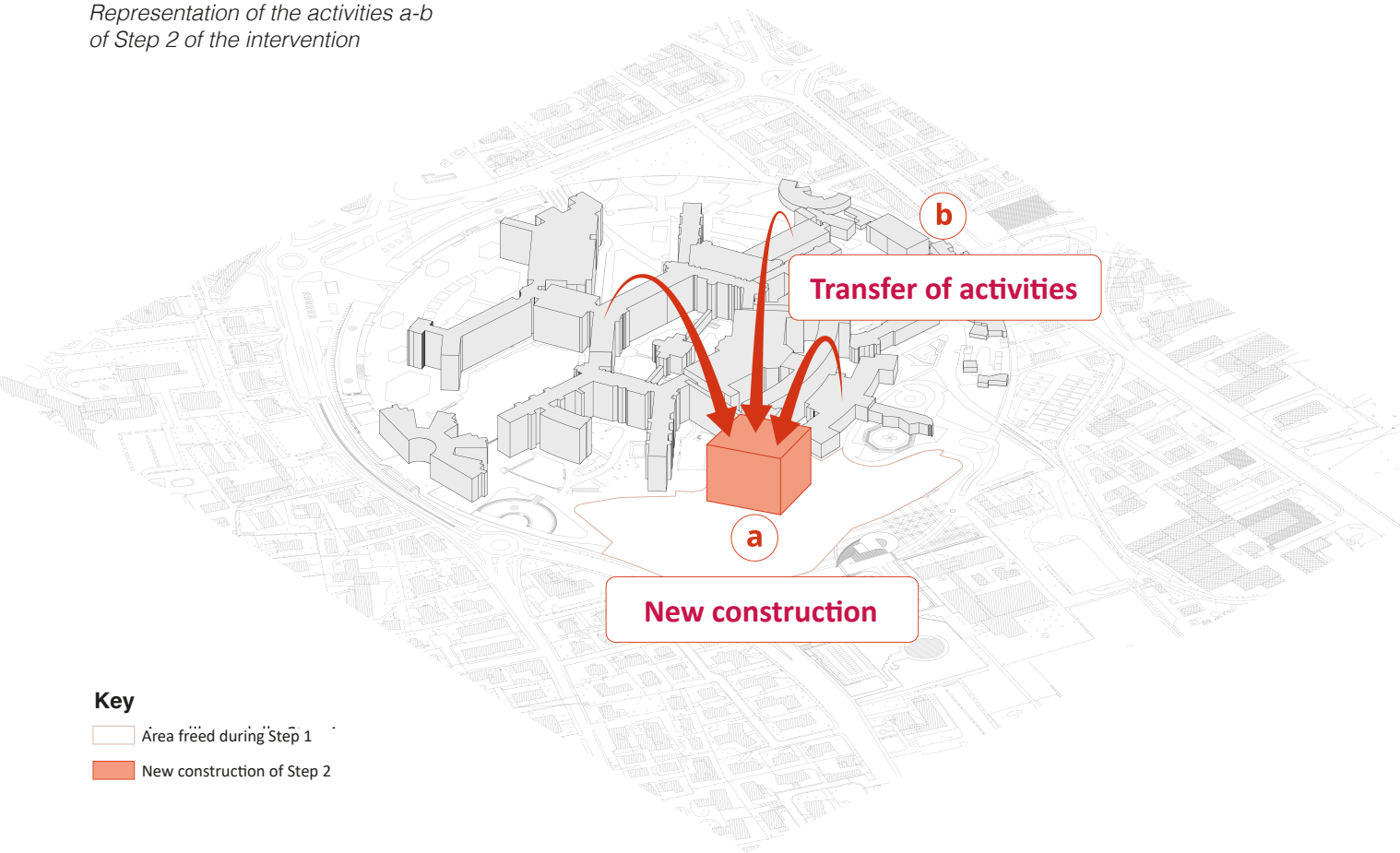
STEP 1

Representation of the activities of Step 1 of the intervention



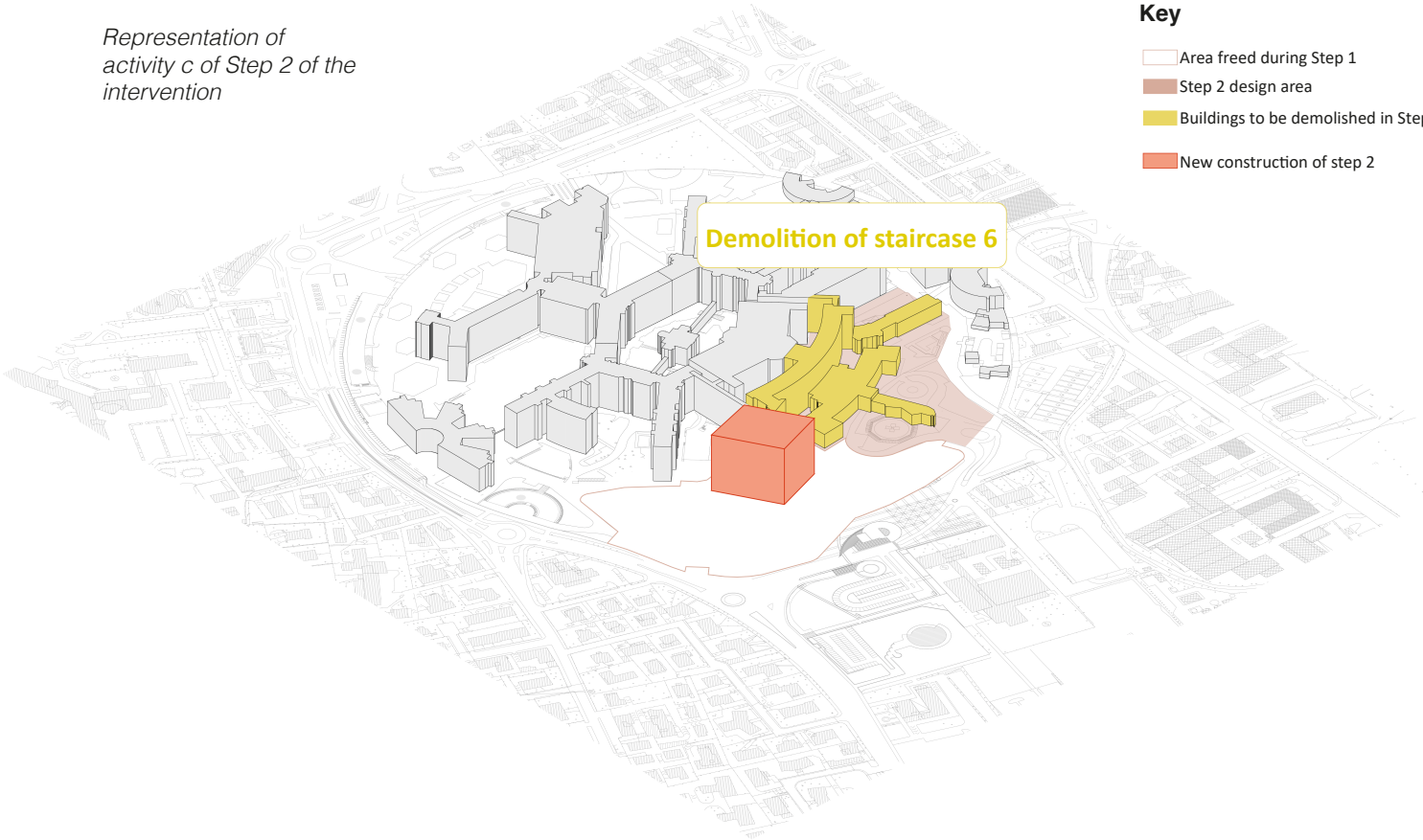
STEP 2A- 2B

Representation of the activities a-b of Step 2 of the intervention



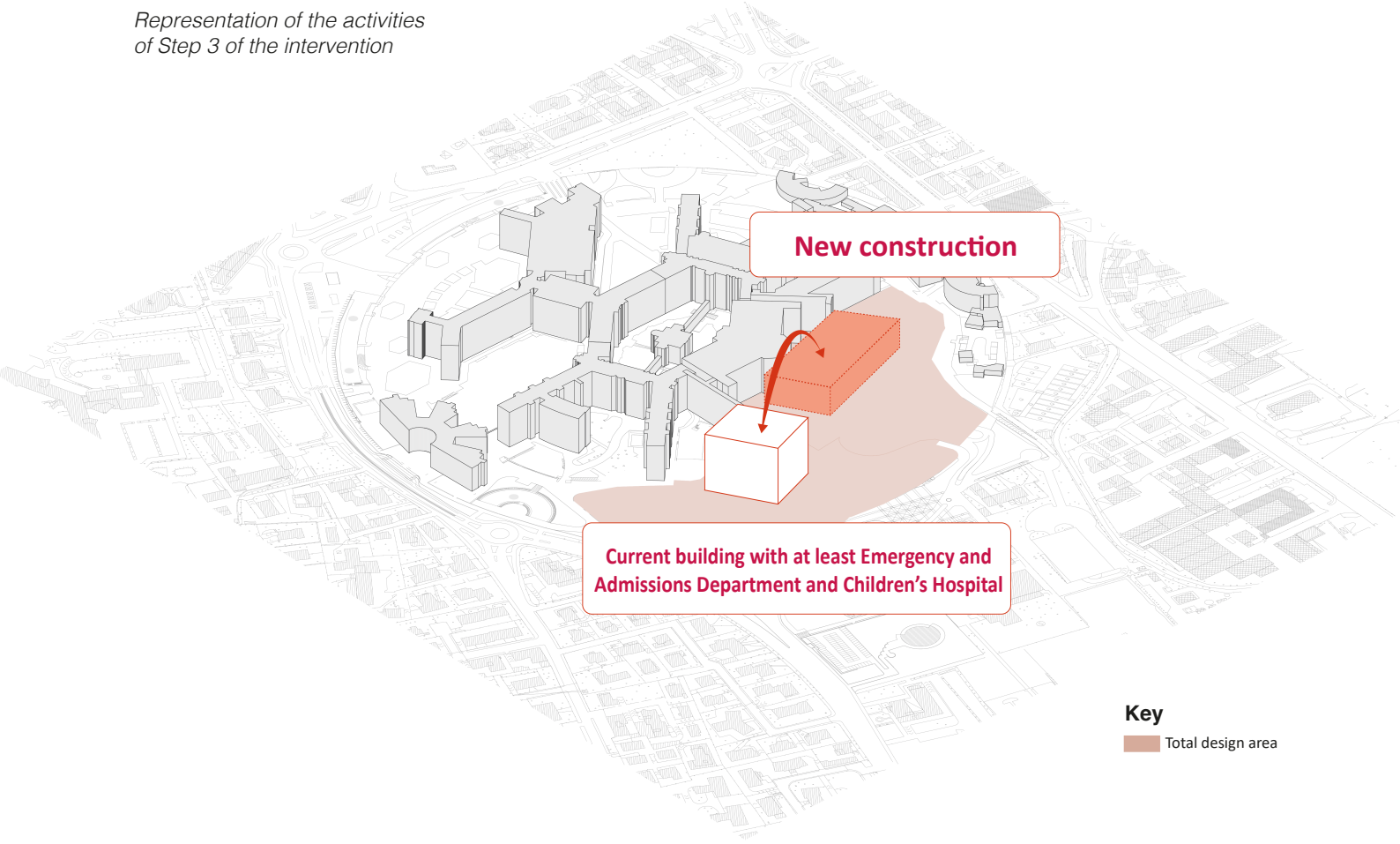
STEP 2C

Representation of activity c of Step 2 of the intervention



Step 3

Representation of the activities of Step 3 of the intervention



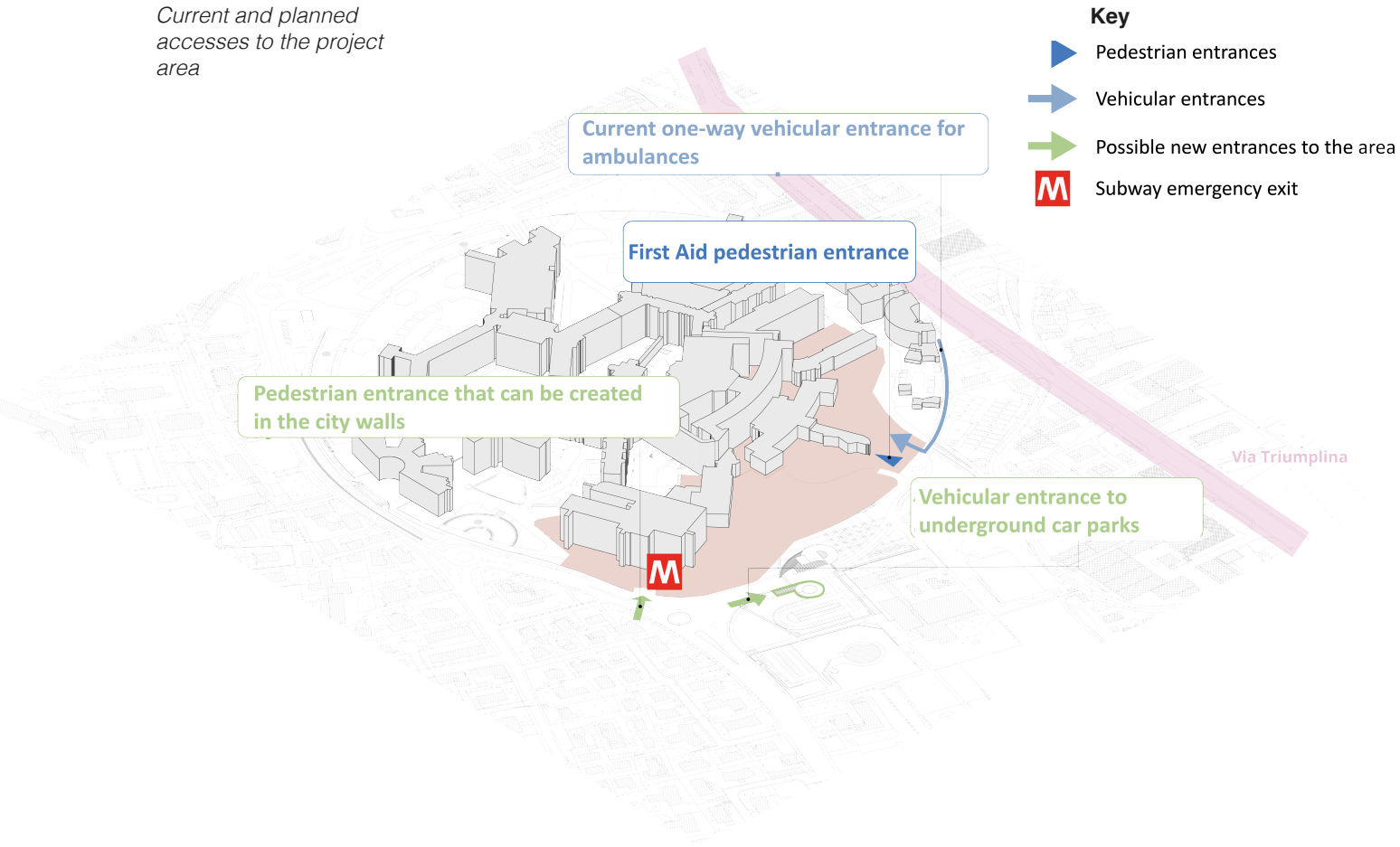
Access to the area and Parking

The current entrances to the project area are located in Via Donatori del Sangue, where there is both pedestrian access to the emergency department and driveway access for users and ambulances to the hot room.
Currently, there are plans to expand a one-way driveway dedicated to ambulances, from Via Triumplina to Via Valsabbina.
The project proposals may provide for further pedestrian access obtained by opening a passage in the Bordoni walls, between Viale Europa and Via Donatori del Sangue. Its feasibility will be assessed at a later stage by the Superintendency of Archaeology, Fine Arts and Landscape for the provinces of Bergamo and Brescia.
As for the car parks, 500 underground parking spaces (PA) are planned, to be connected to the current underground car park outside the Hospital, located between Viale Europa and Via Donatori del Sangue. **These 500 PAs are to be considered as replacements for the current surface car parks** in the Hospital, which aims to acquire an increasingly pedestrian calling, with a view to greater sustainability and integration with the urban fabric.
The diagram below shows the accesses to the area described above, remembering that the position of the possible new pedestrian access represented is only illustrative, and is not mandatory regarding its location.

Links with existing buildings

The newly built volumes must provide a physical connection with the existing buildings, in particular with Monoblock D housing the surgical block and Block 05 of the kitchen/canteen. It also requires a strategic connection and routes with Block 08 of the morgue.
Maximum technological, locational and functional freedom is permitted for the definition of connections.

Current and planned accesses to the project area



Existing underground parking area

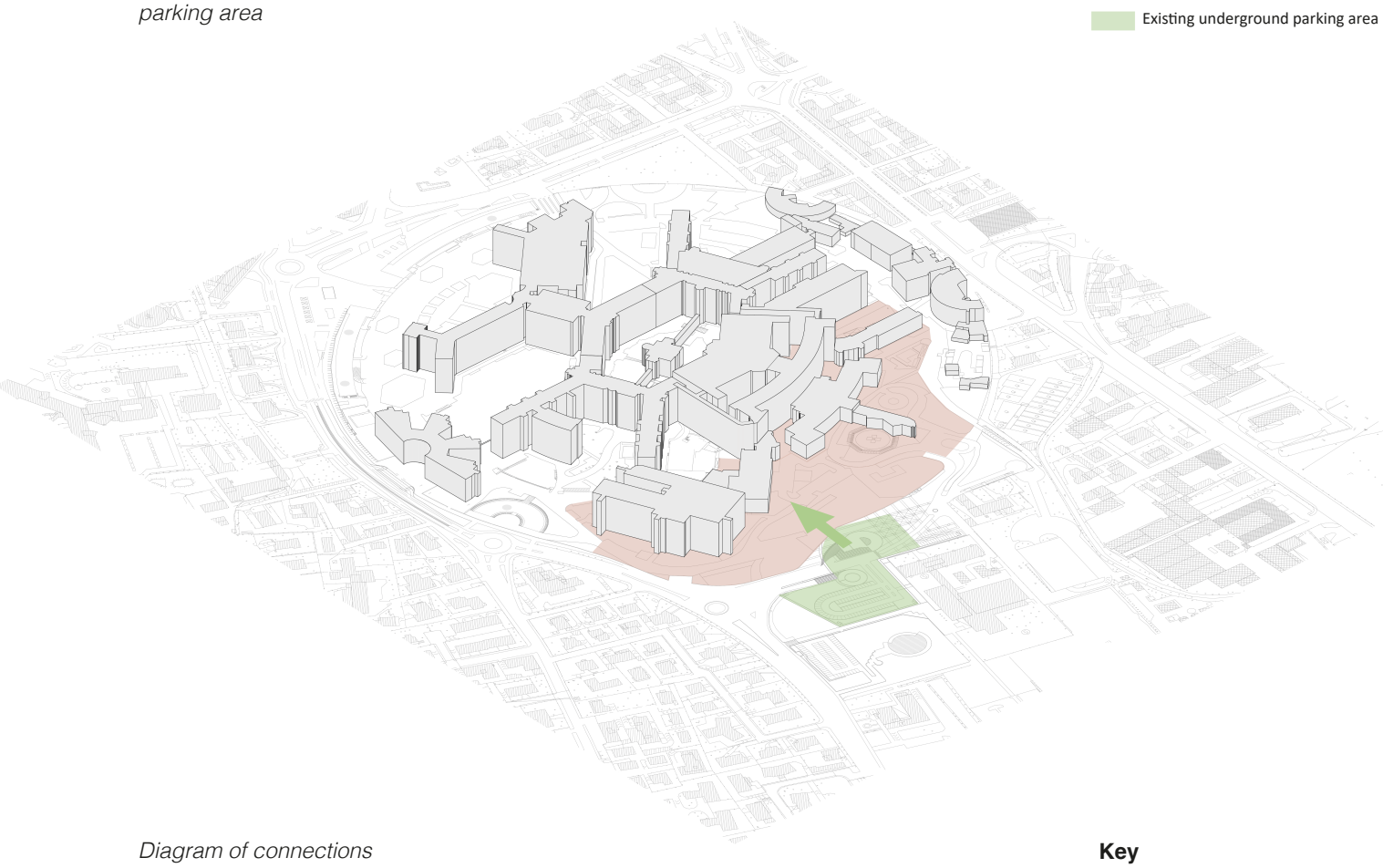
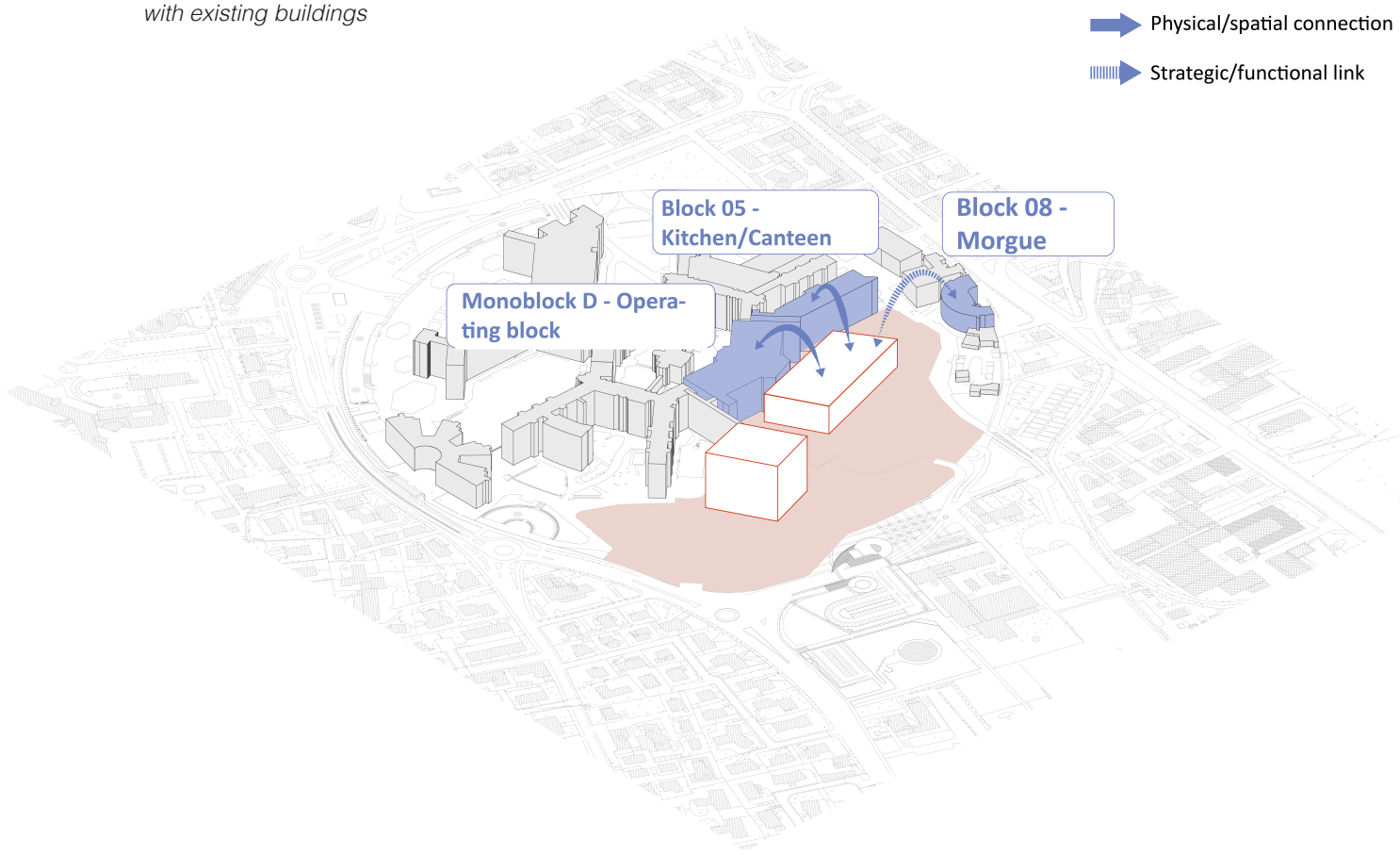


Diagram of connections with existing buildings



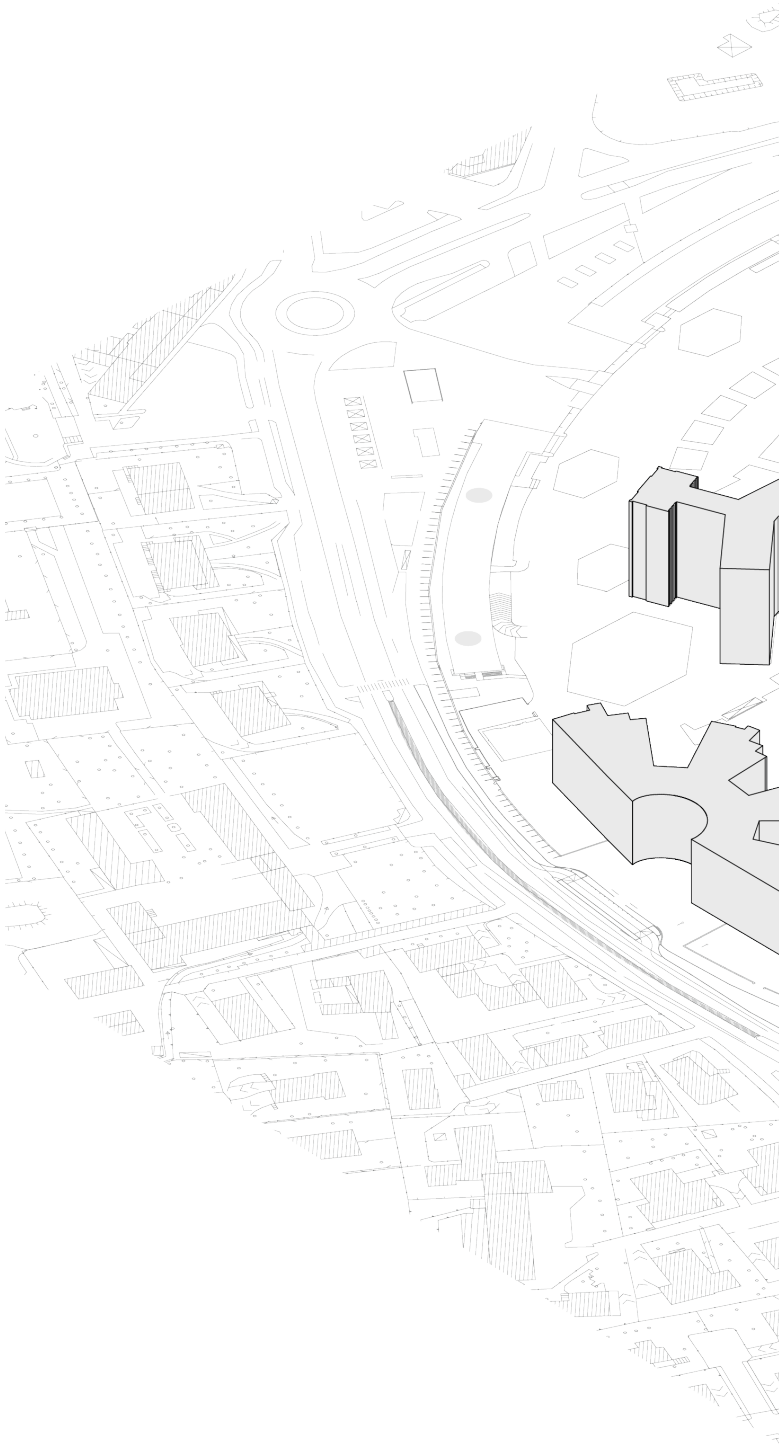
Constraints of the project area

In the analysis of the current situation carried out in the previously drawn up DOCFAP, a number of constraints related to the Blocks were collected as a result of continuous discussions with the Authority. This provided greater awareness of the Hospital and a specific processing framework. Five types of binding elements were identified:

1. buildings covered by existing Project Financing contracts;
2. presence of other surgical blocks in hospital blocks that can be used, in the future, for daytime or week-based hospital activities, also to allow the organisational separation of paths of minor surgery patients;
3. buildings that have not undergone seismic upgrading;
4. buildings dating back to the first construction in the 1940s-1950s;
5. archaeological constraints.

Constraints on blocks affected by Project Financing contracts

These interventions involved the renovation of existing buildings and the construction of new blocks, such as Monoblock D and, with it, the recently built current 17 operating theatres, which already comply with the requirements of current legislation, and are already located in a strategic area for the construction of the new hospital complex.
The diagram below shows the blocks that are bound by Project Financing contracts. Hence, they may not be demolished or reconstructed, as they are subject to PPP contracts in place. The central portion of Block A (stairwell 1-2 – Central Body), Block C in its entirety, Building "Monoblock" D and the Kitchen are involved.



Key

01 Building A - main body
03 Building C
04 Monoblock Building D (05) Kitchen
05 Building A - main body

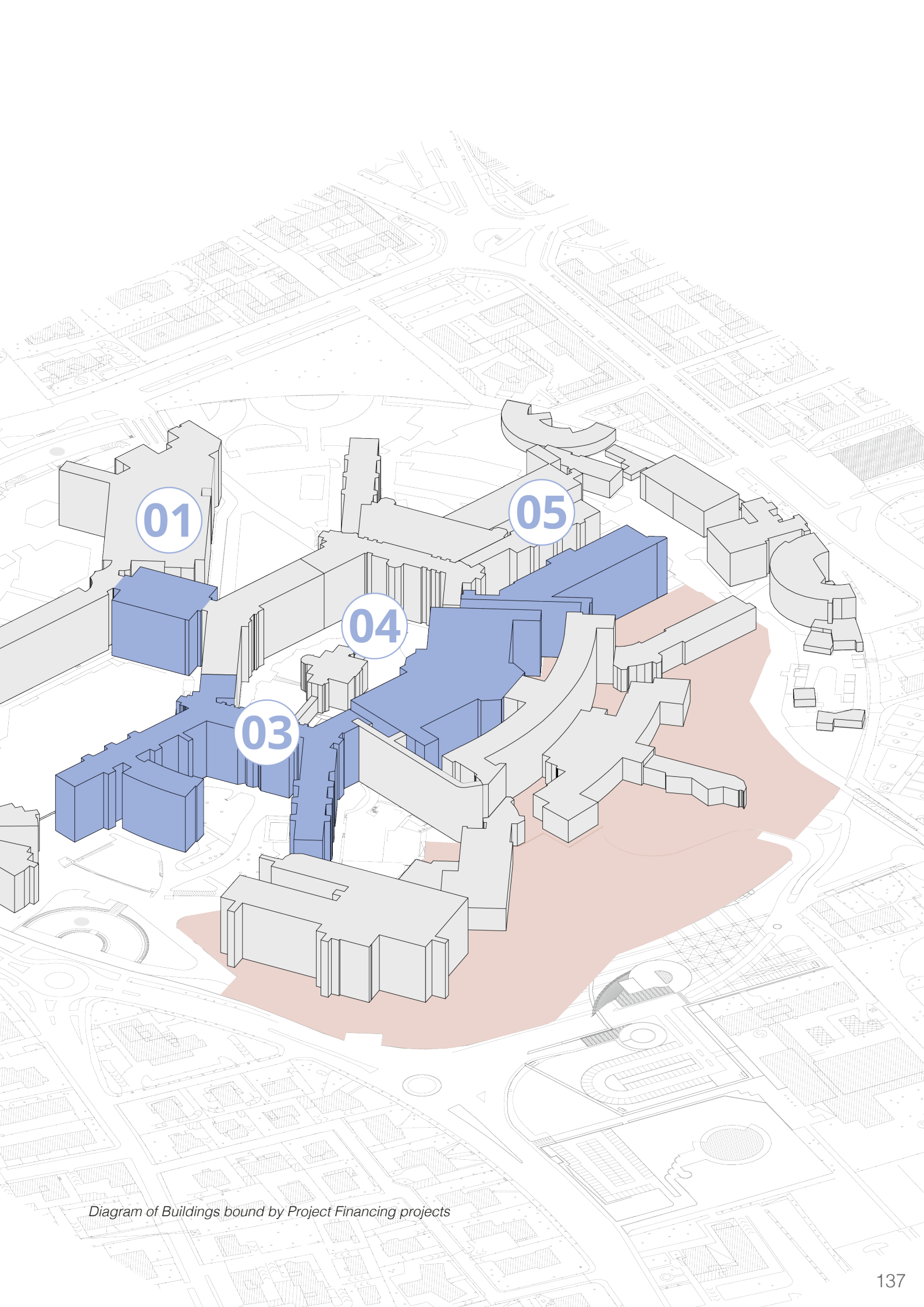


Diagram of Buildings bound by Project Financing projects

Constraints on blocks that are not seismically adequate

Finally, the diagram below shows the buildings that are not seismically adequate and, therefore, are not suitable to host strategic functions unless they are subject to heavy structural interventions. The southern wings (stairwell 1 west and east) of Building A, the "Satellite" Block and the one intended for infectious diseases are not seismically adequate. The north wings (stairwell 2 west and east) of Building A and the central portion (stairwell 3/4) of Building B have been adapted in the past and no longer meet legal requirements today.

Constraints on buildings dating back to the first construction in the 1940s-1950s

The diagram on the following page shows the constrained buildings as they are of major historical and cultural interest to the city of Brescia, namely Buildings A, B and C, which date back to the first construction in the 1940s-1950s.

Archaeological constraints

With regard to the existing constraints, it should be noted that the historical “Bordoni” part of the buildings and walls of the Spedali Civili Hospital was built more than seventy years ago; therefore, based on art. 12 of Italian Legislative Decree no. 42/2004, they are subject to verification of the existence of artistic, historical, archaeological or ethnoanthropological interest by the competent Superintendency. The project will involve buildings not yet subject to the aforementioned restriction (the Satellite General Hospital was completed in 1967 and the Infectious Diseases Building in 1977), but there will still have to be a discussion with the Superintendency to create buildings that have a similar architectural language to the existing one. As for the new access points to the area, they can, therefore, be obtained by opening gates only in the part of the more recent walls. Moreover, the intervention lot on which the Spedali Civili Hospital and the Children's Hospital are situated is within the area of archaeological interest, which involves the historic centre and extensive portions of the urban fabric along the historical access roads to the city. Hence, it will be necessary to delegate the viability assessment of carrying out fact-finding tests in agreement with the Superintendency to the final planning phase.

Diagram of seismically inadequate buildings

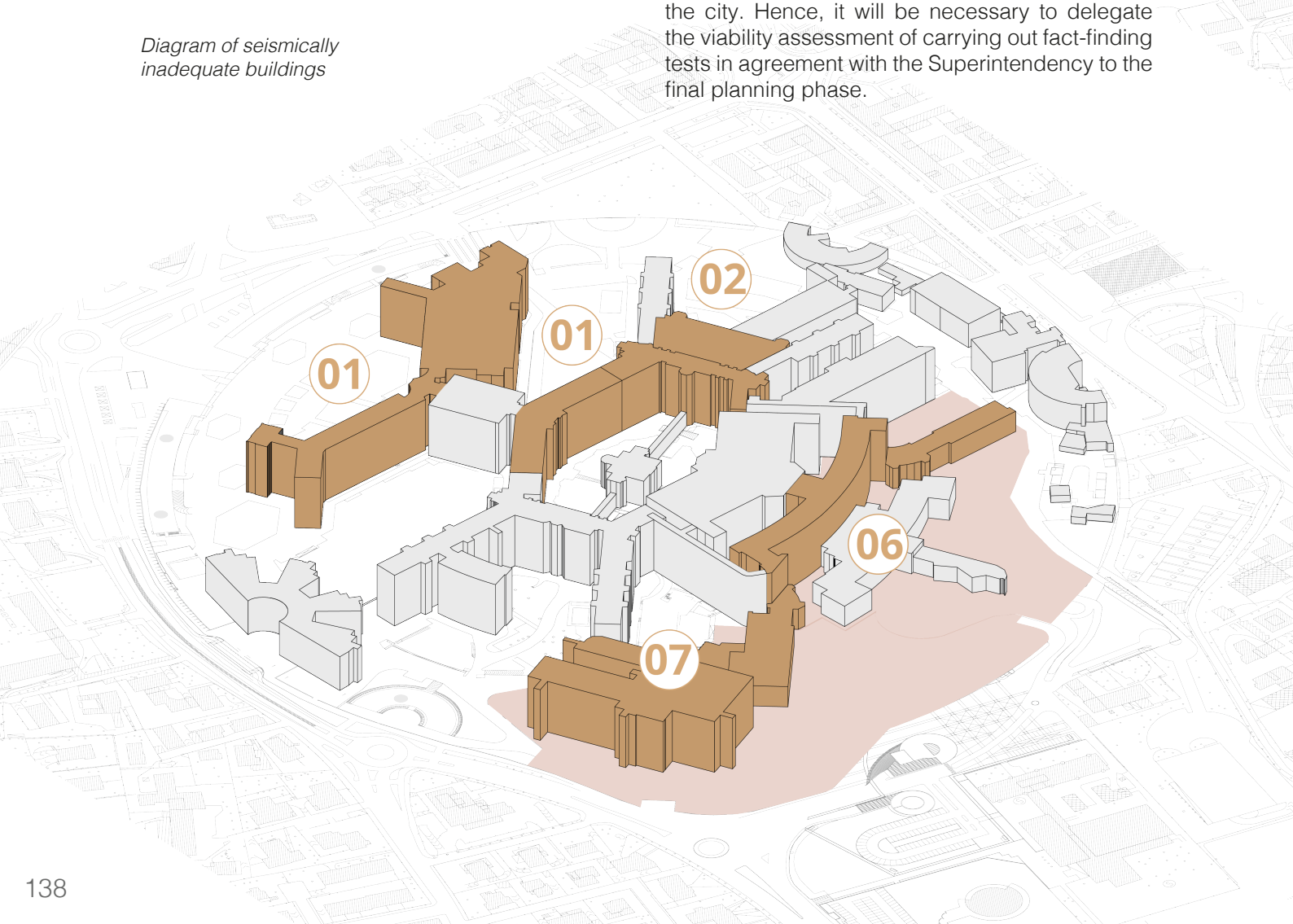
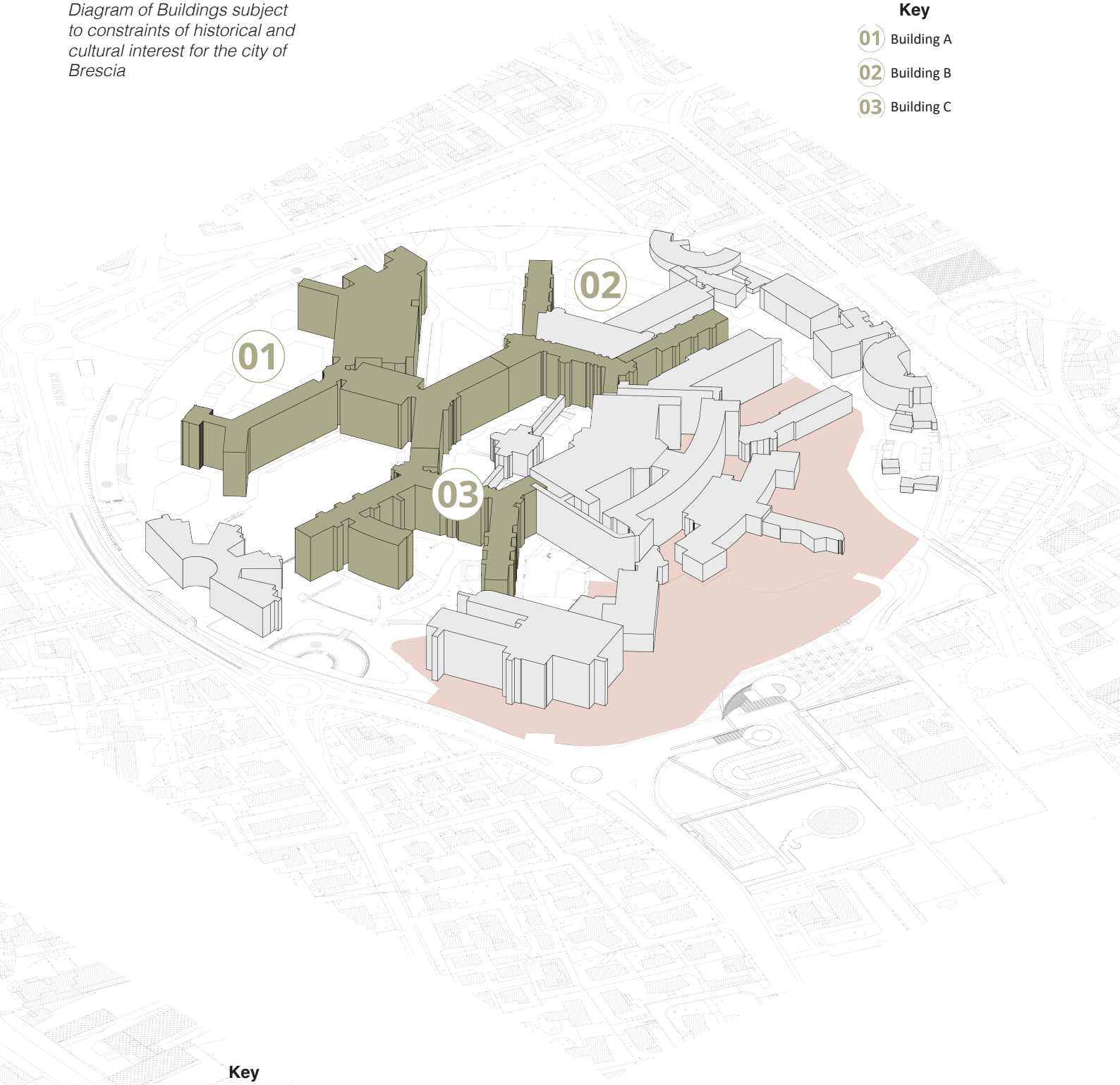


Diagram of Buildings subject to constraints of historical and cultural interest for the city of Brescia



Key

Buildings never seismically adapted

01 Building A (Staircase 1 west and east)

06 Satellite Building

07 Infectious Building

Buildings that no longer comply with the law (Regulation 2000)

01 Building A (Staircase 2 west and east)

02 Building B

6

FINANCIAL PLAN AND ECONOMIC FRAMEWORK

The chapter highlights the economic and financial constraints, the sources of financing and the general economic framework of the intervention to allow a “realistic” and informed design from the earliest assumptions of development.

Financial and economic framework

The chapter highlights the economic and financial constraints, the sources of financing and the general economic framework of the intervention to allow a "realistic" and informed design from the earliest assumptions of development.
The redevelopment of the Spedali Civili di Brescia Hospital involves the construction of the new Main Hospital, with a Single Emergency and Admissions Department (DEA), and the Children's Hospital. The process is divided into operational phases to guarantee continuity of care. In addition, the demolitions of the "Infectious Diseases Building and the Satellite Building with Forebody" are the focus of this intervention.
To complete the project, about 500 underground parking spaces are planned to free up outdoor areas of the Hospital to be converted to green areas. On the basis of these data provided in the previous chapters, healthcare macro areas have been dimensioned; parking and road spaces and green areas have also been identified. The total area assigned to this project is approximately 50,000 sq.m, within the existing walls.

DEFINITIVE SETTING:

The following is a summary of the main numerical parameters:

- MAIN HOSPITAL: 40,700 sq.m
- CHILDREN'S HOSPITAL: 19,700 sq.m
- TOTAL NEW HOSPITAL: 60,500 sq.m
- Multi-storey underground car parks for staff for about 500 convertible parking spaces in case of a medical emergency.

Estimated total cost of works: circa **€239,093,488.23.**
Value Building Box + Multi-storey parking + Outdoor Areas + Available amounts (excluding Furniture and Medical and ICT Technologies) total €325,800,000.00
Total value (including Furniture) **€364,000,000.00**
The essential elements of the dimensional and economic structure developed for the Brescia Hospital of the Future are the following:

- **surface area of the Brescia Hospital of the Future:** 60,500 sq.m data calculated on the portion of the newly built hospital;
- **multi-storey car parks**: for Staff built with semi-underground or underground multi-storey structures counting 500 parking spaces in 18,000 sq.m, including the road linking up with the existing car parks (replacing existing parking areas within the hospital perimeter and to be converted into green areas);

MACRO AREAS OF THE NEW HOSPITAL COMPLEX	sq.m*	%*
INPATIENT AREA *Main Hospital inpatient area* *Children's Hospital inpatient area*	26,000	43% *33%* *10%*
MATERNAL AND INFANT AREA	6,500	11%
EMERGENCY-URGENCY AREA *Emergency-Urgency Area - Main Hospital* *Emergency-Urgency Area - Children's Hospital*	11,500	19% *16%* *3%*
DIAGNOSTIC AND THERAPY AREA *Diagnostic area - Main Hospital* *Diagnostic area - Children's Hospital*	3,300	5% *3%* *2%*
SURGICAL AREA *Surgical area - Main Hospital* *Surgical area - Children's Hospital*	6,200	10% *7%* *3%*
Total net of technical rooms	*53,500*	*88%*
TOTAL	**60,500****	**100%**

*The dimensional parameter indicated is not mandatory, but a starting point to be developed according to the specific needs expressed by the contracting authority.
** Area including connective sites, façades and technological rooms

- **Green Areas**: The New Park will be built on the surface area freed up by the demolitions. It will be conceived as a green space for relaxation and well-being, accessible to all, which will help to improve the surrounding environment and enhance the area with an important resource for the community.
- **Furniture**: the economic parameters refer to the furnishing of ordinary inpatients and are aligned with the benchmarks of reference;
- **Medical and ICT technologies**: a quota of medical technologies has been calculated to complete the share of furniture and equipment to cover more than 10% of the overall amount of funding;
- **The sums available**: the value of the resolution of any interference is included in the item "unforeseen" valued as equal to 5% of the total value of the Works.

The enhancement of the Works and Furniture related to the construction of the New Brescia Hospital of the Future must be developed according to the principles and parameters specified below:

1. reference to Institutional Guidelines of national importance relating to the cost of building and equipping Hospitals;
2. reference to Price Lists for Public Works in recent updates.

The amount of works to be planned is €239,093,488.23, including safety charges. Compliance with this amount and with the provisions of the Technical and Economic Framework is to be considered binding as a maximum limit linked to the relative financial coverage.

The estimate of the cost of the work was defined according to economic and financial resources, programming requirements and the following bibliographic sources:

- Contribution to research 263/2018
- "Hospitals, Theoretical costs of construction and maintenance 2017" published by IRES Piemonte. The document reported the results of comparative assessments to calculate the metric estimation, defining the costs per square metre for areas intended for healthcare and non-healthcare use, also qualified, for different types of functional areas. On this starting point, the parameter values have been updated, according to the changes in the concise ISTAT index of construction costs in analogy to the methodology of art.60 of Legislative Decree 36/2023.
- Annual Report 2024, Next Generation Hospital, of the research platform JRP Healthcare Infrastructures, with particular reference to the results of the Observatory on the Costs of Healthcare Infrastructures in the chapter "Construction Costs".

As highlighted, this average value refers only to the hospital "Building Box", including parking, external accommodation, interference resolution - sub-services and demolitions. It does not include the following additional cost items:

- **Transfers**
- **Roads outside the perimeter of the Hospital**
- **Outdoor green areas and accommodation, fences, etc.**

The competition may include revisiting the functional surface areas, relating to each proposal submitted; however, the total cost must not exceed the financial resources of the work. In the tender document "Summary calculation of expenditure and economic framework of the project", the competitor must complete the following table to prove the verification carried out on the feasibility of the individual proposal.

ART. 20 OF LAW 67/1988 The construction of the Brescia Hospital of the Future, as part of the Redevelopment of the Spedali Civili di Brescia Hospital, amounting to €364 million, will be completed with the resources specified below:

1. for €260,300,000.00 in the shares referred to in art. 20 of Law no. 67 of 11 March 1988 reserved for the Lombardy Region for signing Programme Agreements;
2. for €13,700,000.00 from resources pursuant to art. 5 bis of Legislative Decree 502/92, as introduced by Legislative Decree no. 229/99, pursuant to Lombardy Regional Resolution no. XII/2478 of 03/06/2024 amending the overall investment programme for Healthcare approved by Regional Council Decree no. XI/5835 of 29/12/2021 and by Regional Council Decree no. XII/378 of 29/05/2023
3. for €90,000.000.00 based on resources being defined.

	sq.m	€/sq.m
EMERGENCY AREA		
SURGICAL AREA		
DIAGNOSTIC AND THERAPY AREA		
MATERNAL AND INFANT AREA		
INPATIENT AREA		
LINK UP AND HOSPITALITY AREA (EXT/INT)		
TECHNOLOGICAL AREA		
UNDERGROUND PARKING AREA		
DEMOLITIONS		
EQUIPPED VEGETATION - URBAN PARK		
ROADS, ACCESSIBILITY, SQUARES, ETC.		
OTHER		

Example of a table for parametric quantification based on the estimated surface area for each area or type of intervention

7

MINIMUM ENVIRONMENTAL CRITERIA

The following chapter summarises the requirements relating to the indications preparatory to meeting the Minimum Environmental Criteria as per current legislation.

Minimum Environmental Criteria

With this initiative, which will lead to the definition of a new future-oriented hospital complex, the LHA (ASST) Spedali Civili contributes to achieving the environmental objectives set out in the Action Plan for Environmental Sustainability of Consumption in the Public Administration Sector (PNA GPP), introduced with the Environment Ministerial Decree of 11 April 2008 and updated with the Environment Ministerial Decree of 23 June 2022, amended by the Corrective Decree of 5 August 2024.

In compliance with articles 57 and 83 of Legislative Decree 36/2023 and subsequent amendments, the Minimum Environmental Criteria (CAM), issued by the competent Ministry and applicable to the project, are an integral part of the Technical Performance Specifications.

Minimum environmental criteria are the environmental requirements defined for the various phases of the construction process, aimed at identifying the best design solution, product or service from an environmental point of view along the life cycle, taking into account market availability.

The main objectives of CAMs are:

1. **Promote Sustainability**: Encourage the use of sustainable resources and ecological construction practices.
2. **Energy efficiency:** Improve the energy efficiency of buildings and reduce energy consumption.
3. **Waste management:** Promote the reduction, reuse and recycling of materials.
4. **Air and soil quality:** Reduce the emission of pollutants and improve indoor and outdoor air quality.
5. **Protect Biodiversity:** Safeguard local ecosystems during construction and building management.

The requirements are binding in the case of public initiatives and represent fundamental criteria to achieve the design intentions in relation to environmental and energy sustainability, as well as landscape integration.

To demonstrate how the objectives are to be achieved, the designer will have to produce a CAM report, a mandatory design plan, which will have to be prepared at all levels of design, from technical and economic feasibility to executive.

In addition, the successful designer will have to draw up a **CAM Report** in which, for each criterion, information is provided relating to:

the **design choices** that ensure compliance with the criterion;

design plans in which references to requirements relating to compliance with minimum environmental criteria can be found;

the **requirements of materials** and construction products in accordance with the minimum environmental criteria contained in Ministerial Decree (MITE) no. 256 of 23/06/2022 Official Gazette 183 (CAM Edilizia) indicates the means of proof that the executor of the works must submit to the Works Supervisor.

The Report should also highlight the **design context** and the reasons that led to the possible partial application or non-application of minimum environmental criteria, such as:

- construction product or material not covered by the project;
- particular site conditions that prevent full application of one or more minimum environmental criteria, for example, the small intervention area in consolidated urban areas, which hinders full compliance with the percentage of permeable soil or the impossibility to modify the façades of existing buildings to ensure the required performance on natural lighting.

The designer, through the analysis carried out in the Report, integrates the project with the technical specifications resulting from the application of the criteria contained in the reference chapters, as specified below.

Territorial-urban technical design specifications

The intervention implies changes in the state of the places, as it is a new construction. The area identified for the location of the New Hospital is situated within the boundaries of the Brescia hospital area, in a consolidated urban context. The intervention must, therefore, relate to both the current buildings of the hospital complex and to the surrounding building fabric.

The area is also affected by a high presence of bus and subway lines that are currently operational, which already guarantee easy access to the hospital, and which may be implemented in the future.

The objectives that will have to be taken into account pursuant to Ministry of the Environment Decree no. 256 of 23/06/2022, with particular reference to urban-territorial aspects, have the purpose of:

- ensuring optimal access to sunlight for all buildings, so that the maximum amount of natural light becomes available;
- allowing building façades to be partially shielded from other adjacent buildings or structures to limit excessive summer heat radiation, if sufficient natural light is available;
- guaranteeing access to the sun all day long for all solar systems built or designed;
- providing adequate shielding for buildings and outdoor living areas from the prevailing winter winds.

The following criteria should be particularly considered:

- **Naturalistic and landscape insertion;**
- **Permeability of the territorial area;**
- **Reduction of the "summer heat island" effect and air pollution;**
- **Reduction of the impact on the surface and underground hydrographic system;**
- **Primary infrastructure;**
- **Secondary infrastructure and sustainable mobility;**
- **Energy supply;**
- **Report on the state of the environment;**
- **Water saving.**

The arrangement of green areas should be properly evaluated, defining the tree and shrub species to be planted in these areas, taking into account the function of absorption of pollutants in the atmosphere, microclimate regulation and using essences characterised by reduced water requirements, resistance to plant pathologies, absence of harmful effects on human health, as well as design solutions that facilitate **maintenance**.

The energy supply system (electrical and thermal) will have to cover some or preferably all of the needs, through the installation of photovoltaic systems and heat pump systems.

The design solutions related to **energy supply**, the type of essences identified for green areas, and the choice of permeable materials (draining materials, green surfaces, floors with open mesh or grid elements, etc.) and with a Solar Reflectance Index (SRI) of at least 29, will contribute to reducing the impact on the microclimate and air pollution. In addition, with regard to roofs, the use of **green** roofs should be privileged.

Actions must be taken to avert and/or prevent erosion, compaction, landslides or floods, and in particular those necessary to ensure correct surface water runoff on green areas using natural materials as far as possible. With regard to groundwater, actions will have to be defined to prevent spillage of pollutants onto the ground and underground, and to protect the building. To contain the phenomenon of runoff of impermeable surfaces, it is important to provide for the conveyance of first rainwater distributed on potentially polluted surfaces, called drains (road surfaces, parking areas, building roofs, etc.),

to rainwater collection systems equipped with specific purification plants in relation to the type of pollutants present.

With regard to primary infrastructure, design strategies must be adopted to obtain the necessary authorisations to acquire the qualification, ensuring correct environmental inclusion of the work in the surrounding context through:

- The study and reconstruction of a noise propagation model for the installation of sensitive receptors such as the hospital in question;
- The collection, purification and reuse of rainwater;
- The choice of lighting systems with low consumption that guarantee minimisation of light pollution. In addition, on the basis of the needs that emerge, it will be possible to define strategies to promote sustainable mobility and implement them through specific design choices.

Technical design specifications for buildings

Regarding the newly built buildings (Technical Design Specifications for the Building), criteria related to **energy aspects** (both supply and performance), **internal environmental comfort, and Life Cycle Assessment (LCA) take over**. Also pursuant to Ministerial Decree 256/2022, as defined in Chap. 2.4, the criteria to be analysed are:

- Energy performance;
- Interior lighting systems;
- Inspection and maintenance of heating and air conditioning systems;
- Airing, ventilation and air quality;
- Thermal well-being;
- Natural lighting;
- Shading devices;
- Air tightness;
- Electromagnetic pollution in indoor environments;
- Acoustic performance and comfort;
- Radon;
- Work maintenance plan;
- Disassembly and end of life.

With regard to energy requirements, please refer to the previous point. In order to encourage **water saving**, the project should:

- Ensure **sustainable use and water** protection by providing facilities that can optimise this resource during its use;
- Provide for the **collection of rainwater** for irrigation and/or sanitary discharges, implemented with systems built according to UNI/TS 11445;
- **Systems of flow reduction,** flow control, water temperature control and the use of sanitary appliances with controlled drains will then be defined; A **water monitoring system** will also have to be provided;
- With regard to lighting aspects, studies will have to be conducted to ensure adequate sun exposure based on layout and orientation; correct sizing of the shielding elements; specific lighting studies for health and work environments;
- With regard to **acoustics, the sound response of rooms dedicated to waiting and rest will be studied using specific software, in order to define shapes, materials and surface finishes that allow the achievement of high standards of acoustic comfort.**

In addition to the technical and performance characteristics of the building, the chapter includes: a criterion that examines the **maintenance plan** of the building units with reference to the verification of environmental performance levels (qualitative and quantitative), and a criterion that analyses **end-of-life disassembly**, providing that at least 70% weight/weight of the building components and prefabricated elements used in the project,

excluding installations, is subject, at the end of its life, to disassembly or selective demolition (deconstruction) to then be subjected to preparation for reuse, recycling or other recovery operations. This verification requires preparation of a plan for disassembly and selective demolition. Particular attention will have to be paid to the design of the shell of new buildings by identifying advanced technological solutions for perimeter walls, floors, roofs and windows, and construction type solutions able to minimise energy management costs.

It is essential to carefully choose both the materials for perimeter infills and the external windows and doors that can guarantee limited dispersion in terms of conduction and airtightness. The creation of ventilated roofs and the use of anti-radiant barriers is equally important.

Technical specifications for construction products

Environmental requirements for construction products are defined, where for **construction products equipped with harmonised standard**, Declarations of Performance (DoP) must be made in accordance with Regulation no. 305 of 9 March 2011 and Legislative Decree no. 106 of 16 June 2017. Where the use of materials from recovery processes, recycling, or consisting of by-products is envisaged, reference is made to the definitions provided for by Legislative Decree no. 152 of 3 April 2006, as supplemented by Legislative Decree no. 205 of 3 December 2010 and the specific procedures referred to in Presidential Decree no. 120 of 13 June 2017. As evidence of the recycled or recovered matter content of by-products, certificates shall be provided stating:

- Name of the certified product;
- Percentage value of recycled matter required;
- Release and expiry dates;

Certification and/or declarations of accredited bodies in the environmental field in relation to the type of material considered, such as: an environmental declaration of Product, the "ReMade in Italy" certification with indication on the label of the percentage of recycled material or by-product, etc.

The special tender specifications, in the part relating to the characteristics of the materials, will have to be supplemented with the relevant criteria for the different materials in terms of performance and percentage of components from recovery, recycling, or by-product processes, including the technical specifications and the relevant means of proof. The means of proof of conformity indicated above shall be submitted by the supervisor to the Works Supervisor for the necessary verifications prior to acceptance of the materials on site. Pursuant to Ministerial Decree 256/2022, the criteria to be analysed are:

- Emissions to indoor environments (indoor pollution);
- Concrete packed on site and pre-packaged;
- Precast products in concrete, autoclaved aerated concrete and vibro-compressed concrete;
- Steel;
- Brick;
- Wood products;
- Thermal and acoustic insulation;
- Partitions, against perimeter walls and false ceilings;
- Stone and mixed masonry;
- Flooring;
- PVC windows and blinds;
- PVC and Polypropylene pipes;
- Paints and varnishes.

Technical design specifications for the construction site

The criteria of this chapter concern the project design, and are aimed at the **organisation and**

sustainable management of the site. Hence, they are verified through the CAM Report, which must highlight:

- The ante operam status;
- The planned actions;
- The resulting achievable results;
- The post-op status.

The designer will have to integrate the results of the application of these criteria in the construction project and in the special tender specifications of the executive project, and explain in the CAM Report how the project has taken them into account, pursuant to Ministerial Decree 256/2022, as defined in Chap. 2.6. The criteria to be analysed are:

- "Environmental performance of the construction site", which requires evaluating the environmental aspects of site preparation and operation activities that must be carried out by providing for the following actions: identification of possible critical issues related to the impact on the construction site area, measures to be taken to protect the natural resources, landscape and cultural history present, protection from noise and vibration, protection from gases and pollutants, protection from dust and fumes, energy and water saving, separate waste collection, etc.
- "Selective demolition, recovery and recycling": given the nature of the intervention, which first involves the total or partial demolition of some existing buildings, as indicated in the CAMs in accordance with and for the purposes of art. 34 of Italian Legislative Decree no. 50/2016, it is necessary to adopt selective demolition strategies to optimise the recovery of the different fractions of material. The aim is to encourage recovery - i.e., reuse and recycling - of waste from construction and demolition, with a view to a circular economy;
- "Preservation of the surface layer of the soil";
- "Dumps and fills".

Guidelines for the sustainability of the intervention

The project must aim at **the highest degree of self-regeneration and low maintenance. It must guarantee quality and multifunctionality**: ecological (aspects of environmental health, improvement of the microclimate and aspects of biodiversity), recreational use, cultural, for psychophysical well-being, by:

- trying to minimise the introduction of waterproof surfaces to **optimise ecological functions** and the possibility of providing Ecosystem Services (SE);
- using permeable surfaces to f**acilitate the infiltration of** rainwater;
- for the remaining green areas, providing large areas occupied by **tree and/or shrub vegetation** in structured patches, in relation to the wooded areas on the margins and capable of compensating at least partially for SE deficits related to the regulation of microclimate and CO2;
- placing the currently planned road level parking spaces in the structure, or underground (if adequate resources are present), in order to **maximise** the **presence of open spaces available for green accommodation**. Use the excavation lands for morphological modelling interventions aimed at improving the landscape insertion of the transformation;
- Equip parking lots and paved areas of the paths and internal roads with **shading trees** in order to reduce the heat accumulation of paved surfaces and ensure microclimatic improvement;
- Provide for the planting of seed mixtures for **flower lawns** in lawn areas on both deep and hanging vegetation. Preferably select native species with scalar blooms in such a way as to ensure progressive blooms during the year by supporting the SE of Pollination;
- Create **water collection basins** that can be later used to irrigate green areas;

- Maintain **usability of hospital green areas** by the population;
- Provide **production-oriented green spaces**, reserved for hospital catering aimed at prevention through food rehabilitation (ORTI);
- Create the part of the **urban park** inside the project area (AdP) while constructing the building structure and, as far as possible, anticipate greening of the area;
- Use vegetation for the construction of filter zones and for **CO2 capture**.
- Provide for the construction of **noise containment devices** integrated into the park project, for example using appropriate terrain models aimed at performing filter function between infrastructural areas and the green and medical areas provided inside the project area (AdP).
- Provide suitable measures aimed at **mitigating disturbances and creating elevated buffer strips**, or other devices capable of effectively mitigating the various infrastructural impacts;
- Refer to **Best Management Practices** (BMP) or **Nature Based Solutions** (NBS) in future design development, which are able to respond to deficits related to the delivery of the SE Regulation of the water cycle. Water and urban drainage management must use integrated natural solutions that allow to improve the hydrological response of the urbanised territory of the project. The interventions should concern both the design of interventions on roads, squares and related infrastructures, and the redevelopment and/or creation of green areas;
- Envisage green interventions for compensatory purposes (arising from the transformation of forest soil);
- Provide landscape interventions placed in support of the hospital structure in order to correctly insert the work itself;
- Adopt typological models that refer to the study of potential vegetation by examining the current landscape both for morphological aspects and for the plant cover, considering the pedological characteristics, an aspect that strongly conditions the settlement of vegetation.

8

TIMES AND PHASES

The chapter collects the programmatic and temporal request, thus allowing to precisely define the evolutionary steps of the intervention with the relative timing and time schedule.

Times and Phases

The chapter collects planning and temporal requests, allowing a precise definition of the evolutionary steps of the intervention with the respective timescales and timetable, also in relation to the different design phases and obtaining the respective authorisation qualifications.
Starting from the development of all project levels, up to the award of the works, the development and the conclusion of the latter, barring unforeseen events, an overall timeframe was defined as specified below:

- Design phase about 750/800 days;
- Construction phase: about 3,100 days (maximum);
- Total: 10 years and 6 months.

In particular, the LHA (ASST) Spedali Civili di Brescia has mandated Aria S.p.A. (December 2024) to draw up the Technical and Economic Feasibility Project (PFTE), through an international design competition.
The expected timeframes for the individual phases of design development are estimated as shown in the table:

DESIGN PHASE	Award of the Competition	210 natural and consecutive days, from indiction
	Activation of Framework Programme Agreement (FPA) and possible Strategic Environmental Assessment (SEA) procedure	
	Conducting investigations and surveys	40 natural and consecutive days, from the award
	PFTE development and delivery	180 natural and non-consecutive days, from the signing of the contract
	Activation of procedure for planning ***DEMOLITIONS, INTERFERENCES, UNDERGROUND UTILITIES AND TRANSFERS***	
	Approval and Authorisation Titles (CDS and VIA)	120 natural and consecutive days, from the award
	FTE verification	60 natural and consecutive days, from the award
	PFTE approval	5 days following the verification and authorisation certificates of the PFTE
	After admission for funding by the Ministry Law 67/88- Timeframe for the Executive Planning (EP) phase	
	Service order for PE start	1 day after signing the relevant contract
	PE Delivery	90 natural and consecutive days
	EP verification	30 natural and consecutive days
	PE approval	5 days after PE verification
APPROVAL OF TENDER BASED PROJECT	Delivery of projects to Lombardy Region	
	Approval by the Public Works Board of Governors	47 days from submission of the project
CONSTRUCTION	Call for tenders	30 days after PE approval
	Works award	180 natural and consecutive days, from issuance of the call for tenders
	Underwriting the contract	45 natural and consecutive days, from the award
	Between the awarding of the works and the signing of the contract, the LHA will transfer the healthcare activities in the Infectious Building and in the Satellite Short Wing, linked to staircase 7 and external functions falling within the area of intervention (Ecological island/greenhouses/etc).	
	Relocation of underground utilities and controlled demolition of Infectious Building and Staircase 7 Short Wing of Satellite Building.	180 days after approval of signing of the contract
	Construction of first body of the building and landscaping of outdoor areas/roadways	1,000 natural and consecutive days
	Acceptance of works	180 natural and consecutive days
	Transfer of functions from the existing facilities to the new buildings, in addition to the transfer of functions in the Satellite Building and Forepart (both in the new building(s) and in the existing hospital facilities). In 60 days.	
	Relocation of underground utilities and controlled demolition of Satellite Pavilion and Forepart.	180 days after approval of transfers
	Construction of additional body of building and/or hinge to connect the new building(s) to Staircase 14-Building D and external arrangement.	Maximum in 1,000 natural and consecutive days
	Acceptance of works	180 natural and consecutive days
	Final transfers and activation of the of the hospital	

Descriptive table by time and phase

ENVIRONMENTAL REMEDIATION

The chapter details the requirements relating to any reclamation needs and detailed analysis for the area under intervention in order to ensure the urban and environmental feasibility of the project.

Environmental Remediation

Hydrogeological framework

The geological characteristics are those of the plain areas of river origin linked to the Mella River, in close connection with the fluvial glacial deposits, genetically linked to the Alpine pleisic morainic amphitheatres. From the Upper Pleistocene, the alluvial plain was crossed by numerous waterways with migratory characteristics that gave rise to different canals, later filled by overfloods and changes in the route of the ancient river systems. The outcropping in the area under examination shows continental deposits of river origin, which have significant thicknesses and are characterised by substantially uniform conditions. Hence, the geological context of the sector of interest refers to alluvial deposits of Quaternary age referring to Pleistocene and Holocene waterways. These deposits have increasing thickness towards the south, or towards the depocentre of the depositional basin.

The territory of Brescia has a morphological configuration that can be referred to different morphogenetic processes (glacial and fluvial action), often overlapping each other which, combined with anthropic changes, have brought the landscape to its current configuration. The morphology of the intervention area is flat. The landscape in which it falls is in the context of the Lombardy medium plain, regularly flat (located at a variable altitude between 123 and 124 m asl) with gentle slopes, affected by little evidence of the wrecked hydrography. Some weakly depressed areas can be noticed, corresponding in the past to ancient surface water routes, linked to different morphological and climatic conditions from the current ones. The topographic trend is partly modified by anthropic interventions, which have strongly affected the landscape of the entire Brescia plain, especially near the inhabited centres and at sites affected by excavation activities. The area of intervention is not affected by geomorphic phenomena or by any hydraulic problems and is, therefore, stable.

In the municipality in question, the surface waterway network belongs to the Mella River catchment area. The surface hydrographic network of the area, originally characterised by irrigation canals, artificial canals, ditches, dividers, rural drainage, is partially obliterated by past urbanisation works. Along the roads and through some private properties, there are currently underground sewers, partly related to the current sewer network, probably similar to the original natural waterway network. The project area does not interfere with any hydrographic element and, from the analysis of the cartography of the “Hydrographic, Hydrological and Hydraulic Elements” attached to the Municipal Geological Component (September 2012), it does not fall within any of the respect bands envisaged for them. Within the property subject to intervention, there are also no areas subject to hydraulic problems and the runoff of incipient water occurs by delivery to the white water network and green areas for surface spreading. Surface water runoff within the investigation area and in the surrounding areas occurs essentially by surface spreading and no hydraulic problems are reported.

Environmental status of the site

The Environmental Survey Plan carried out at the Hospital in the area adjacent to the intervention area, and aimed at defining the environmental status of the site in relation to the threshold concentrations of contamination (CSC) of pollutants in the environmental matrices in accordance with Legislative Decree 152/06, found that there is contamination. However, as per the ARPA Note Class.11.2 File 2020.1.76.10, of March 2022, it is not to

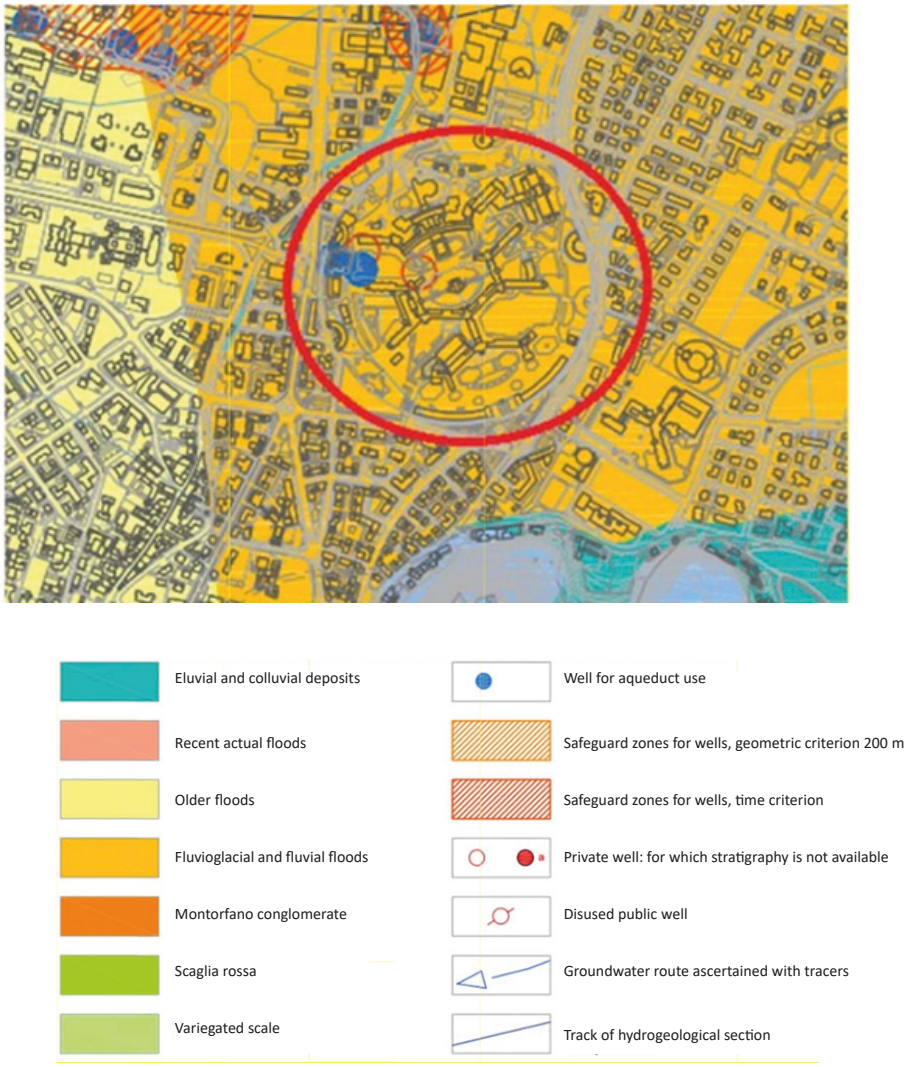


Figure 1 Excerpt from the hydrogeological map of the Municipality of Brescia (Table ALall04-d, 2012).

be considered to have an impact, as: "... it is concluded that for the case in question it is correct to round the concentration values indicated by you (0.12 and 0.13) to the value of the legal limit, which for the parameter in question is 0.1 mg/kg. The concentrations measured in this case are, therefore, compliant with the threshold concentrations of contamination (CSC) envisaged for the specific intended use..."
Hence, the analysis of the materials present within the structure establishes that there is widespread contamination both with regard to the amiantiferous component and phthalate. It is advisable to subject the area to environmental remediation for waste containing asbestos and other hazardous substances (through a specific Waste Management and Asbestos Removal Plan to be submitted to the competent authorities).

Remediation strategies

The Site is a predominantly built-up area located in an urban context, characterised by the presence of residential, industrial and commercial functions. Given the nature of the context of the project area, within the existing hospital base, it is appropriate to consider the aspects relating to environmental quality and management of materials resulting from the important demolition and construction operations.

In particular, the various phases involve the demolition of over 85,000 sq.m of Gross Floor Area (SLP). Therefore, it is advisable to carry out the necessary checks on the quality of the soil and groundwater, with the aim of identifying critical issues arising from the previous uses of the area and from the presence of the network of adjacent sub-services. Any intervention strategies must be oriented towards reducing the impact on the environment, and on guaranteeing the full functional operation of the structure during all phases of the construction site.
Concerning demolitions, the presence of potentially hazardous or polluting materials must first be detected. In this regard, the planning of activities may take into account best practices for the management, removal and disposal of such materials, in compliance with existing legislation and with a view to protecting public and environmental health, especially given the healthcare nature of the intervention.
In a global vision of sustainability, it is worth considering solutions to reduce the impact of site activities on air quality, noise emissions and material disposal.
At the end of the cleaning, demolition and disposal of rubble and building materials, it is advisable to monitor the environmental quality of the cleared area and its suitability to support new building development, in line with the sustainable redevelopment strategies of the area.

10

MATERIALS, ELEMENTS AND COMPONENTS

The chapter collects the specific requirements regarding the use of materials, technologies and components that are useful for the construction of a future-oriented hospital by developing the principles of sustainability, innovation and performance monitoring.

Materials, elements and components

Materials, Elements and Components

In addition to performance requirements for the design of a future-oriented hospital, a particular aspect to consider concerns the theme of materials, elements and components. The design of materials, construction elements and architectural components of a contemporary hospital must meet specific stringent and diversified needs, in line with the functional, technological and health-related requirements of a complex and highly regulated environment.

Among the fundamental criteria for hospital design, three essential aspects emerge:

1. **Maintainability**: the selected materials and technological components must ensure efficient management and reduced frequency or operational agility of routine and extraordinary maintenance interventions, contributing to the economic sustainability of the structure. It is essential to favour surfaces and finishes resistant to aggressive detergents and disinfectants, while maintaining their aesthetic and functional characteristics over time. It is also suggested to verify the ease of inspection, maintenance and/or replacement of plant and technological components in order to ensure the least possible impact on the health-related activity of the hospital and the least discomfort to patients, visitors and operators.
2. **Flexibility**: the hospital must be conceived as an adaptable body, able to respond quickly to new health needs, functional reorganisations or emergencies. Materials and components must, therefore, be easily removable, repositionable or reusable, favouring a dynamic and resilient spatial layout. The possibility of dismantling the solutions to be pursued also thanks to the implementation of industrialised and/or prefabricated solutions ensures an integrated approach to the life cycle of the entire intervention.
3. **Durability**: the solutions adopted must ensure optimal performance in the long term, resisting wear and tear and physical, chemical and biological agents, especially in high use environments such as hospitals.

Innovative and Sustainable Materials

The use of innovative materials is crucial to meet the highest quality standards and promote the health and well-being of both users and operators. In particular, care-related infections have played a decisive role in the spread of the COVID-19 pandemic, and their mitigation will be increasingly important in the near future. For this reason, in synergy with risk monitoring and management activities, it is essential to use high performance, durable and easy-to-clean materials, in relation to medical needs. In particular, it is necessary to introduce innovative materials to reduce the bacterial (and viral) load on finishing surfaces, including eco-active materials and photocatalytic paints, also characterised by high performance and flexible use.

The recommended solutions include:

- **Eco-active materials**, such as photocatalytic surfaces and nanoparticle-treated fabrics, can break down microbial load and improve indoor air quality.
- Antibacterial and antiviral **finishes or systems,** particularly suitable for functional areas with high contact surfaces, such as handles, handrails, lighting systems, wall coverings and worktops.
- **Sustainable materials or systems** with low environmental impact and certified according to international standards, able to guarantee not only high performance but also a reduced life cycle in terms of emissions and resource consumption.

- **Washable and removable technical fabrics**, which are useful for flexible separations in emergency settings or to increase user privacy, ensuring easy maintenance and adaptability to changing health needs.

Monitoring Air Quality

Indoor air quality is a strategic element to control **nosocomial** infections and for the overall well-being of patients and healthcare professionals. It requires the implementation of continuous air quality monitoring systems in all areas of the hospital, with particular attention to critical areas. Such systems must detect parameters such as: particulate concentration (PM10, PM2.5), presence of volatile organic compounds (VOCs), levels of carbon dioxide (CO2) and oxygen (O2), humidity and temperature.
In parallel, the use of mechanical controlled ventilation (VMC) systems with advanced filtration, in synergy with materials containing low volatile organic compounds (VOC), will help create **healthy environments that comply with the criteria of current regulations.**

Integrated approach

The choice of materials and components must be integrated with the overall design strategies, enhancing their ability to interact positively with other aspects of the building. For example, easily sanitised surfaces must be combined with automated or robotic cleaning systems; high thermal inertia materials can support energy efficiency strategies; and resilient, ergonomic flooring can reduce the risk of fatigue for healthcare professionals. The effectiveness of these strategies will have to be monitored over time according to an **Evidence & Practice based design approach.**

Materials and technological components are, therefore, a key asset in the design of a modern hospital, directly influencing its functionality, sustainability and perceived comfort. Design choices must, therefore, be based on a **balance between innovation, sustainability and meeting performance specifications**, while ensuring a safe, welcoming and resilient hospital environment.

Management and maintenance systems

The integration of maintenance and management systems between an existing and a new hospital structure is a strategic challenge that requires careful planning. The main objective is to guarantee operational continuity, energy efficiency and safety of the entire healthcare complex. The systems of the two buildings must be able to operate synergistically. It is, therefore, necessary to adopt standardised protocols. A unified maintenance plan must be drawn up to ensure proper management of infrastructure and technical facilities. This includes preventive, predictive and corrective maintenance, reducing downtime and improving equipment reliability. Effective integration of maintenance and management systems between the existing hospital structure and the new construction must improve operational efficiency, reduce management costs and ensure a safe and functional environment for patients and healthcare professionals. The adoption of innovative solutions and a strategic approach are key elements for the success of this process.

BIBLIOGRAPHY AND ANNEXES

The main bibliographic sources of technical and scientific literature consulted or useful to support the development of design proposals with reference to the main evolutionary trends of health infrastructures are reported. In addition, a list of annexes is given. They form an integral part of the information available.

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Annexes

Annexes

ANNEX 1: General plan of the intervention area

ANNEX 2: DOCFAP (FEASIBILITY DOCUMENT OF DESIGN ALTERNATIVES)

ANNEX 3: Satetellite Pavilion sections

ANNEX 4: Parking plans

ANNEX 5: Photographic survey

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